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最終頁に続く

(54)【発明の名称】蒸着マスク、これを利用した有機ＥＬ素子の製造方法及び有機ＥＬ素子

(57)【特許請求の範囲】
【請求項１】
薄板よりなって引張力が加わるようにマスクフレームに支持された蒸着マスクであって、
少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する単位マスクを少なくとも１つ具備することを特徴とする蒸着マスク。
【請求項２】
前記主開口部は有効蒸着領域を形成するのに use、前記第１ダミー開口部は無効蒸着領域を形成するのに use ことを特徴とする請求項１に記載の蒸着マスク。
【請求項３】
前記第１ダミー開口部は少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置されることを特徴とする請求項２に記載の蒸着マスク。
【請求項４】
前記単位マスクは少なくとも２つ備わり、前記単位マスクの外側で他の単位マスクに隣接しない位置には、前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わることを特徴とする請求項１または２に記載の蒸着マスク。
【請求項５】
前記第２ダミー開口部は前記単位マスクが形成した有効蒸着領域の外側に位置すること

を特徴とする請求項４に記載の蒸着マスク。

【請求項６】

前記第２ダミー開口部は少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されることを特徴とする請求項４に記載の蒸着マスク。

【請求項７】

枠板よりなって引張力が加わるようにマスクフレームに支持された蒸着マスクであって、

少なくとも１つの主開口部を有する単位マスクを少なくとも２つ具備し、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部を具備することを特徴とする蒸着マスク。

【請求項８】

前記各単位マスクの主開口部は有効蒸着領域を形成するのに使われ、前記第２ダミー開口部は前記単位マスクが形成した有効蒸着領域の外側に位置することを特徴とする請求項７に記載の蒸着マスク。

【請求項９】

前記第２ダミー開口部は少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されることを特徴とする請求項７に記載の蒸着マスク。

【請求項１０】

基板に所定パターンの第１電極を形成する工程と、

前記基板の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する有機膜形成用蒸着マスクを介在して、前記主開口部を通じて、少なくとも前記第１電極を覆うように、有機発光物質を含む有機物で有効発光領域を含む有機膜を形成し、前記第１ダミー開口部を通じて前記有効発光領域の外側に第１ダミーパターン領域を形成する工程と、

前記有機膜の上部に前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極を形成する工程と、

前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法。

【請求項１１】

前記有機膜形成用蒸着マスクは、前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置されることを特徴とする請求項１０に記載の有機ＥＬ素子の製造方法。

【請求項１２】

前記有機ＥＬ素子の製造方法は単一工程で少なくとも２つの有機ＥＬ素子を製造し、

前記有機膜形成用蒸着マスクは、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の有機膜を蒸着できるものであり、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わっていることを特徴とする請求項１０に記載の有機ＥＬ素子の製造方法。

【請求項１３】

前記有機膜形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項１２に記載の有機ＥＬ素子の製造方法。

【請求項１４】

前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向で前記単位マスクに隣接して設置されることを特徴とする請求項１２に記載の有機ＥＬ素子の製造方法。

【請求項１５】
前記第２電極の形成工程は、マスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する第２電極形成用蒸着マスクを介在して、前記主開口部を通じて前記有効発光領域の上部に第２電極ラインを含む第２電極を形成し、前記第１ダミー開口部を通じて前記有効発光領域の外側に第２ダミーパターン領域を形成することを特徴とする請求項１０乃至１４のうちいずれか１項に記載の有機ＥＬ素子の製造方法。
【請求項１６】
前記第２電極形成用蒸着マスクは、前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置されることを特徴とする請求項１５に記載の有機ＥＬ素子の製造方法。
【請求項１７】
前記有機ＥＬ素子の製造方法は単一工程で少なくとも２つの有機ＥＬ素子を製造し、
前記第２電極形成用蒸着マスクは、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できるものであり、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わっていることを特徴とする請求項１５に記載の有機ＥＬ素子の製造方法。
【請求項１８】
前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着する位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項１７に記載の有機ＥＬ素子の製造方法。
【請求項１９】
前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されたことを特徴とする請求項１７に記載の有機ＥＬ素子の製造方法。
【請求項２０】
前記有機ＥＬ素子の製造方法は単一工程で少なくとも２つの有機ＥＬ素子を製造し、
前記第２電極の形成工程は、マスクフレームにより引張力が加わるように支持され、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できる第２電極形成用蒸着マスクを介在してなされ、
前記第２電極形成用蒸着マスクの前記単位マスクの外側で他の単位マスクに隣接しない位置には、前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わっていることを特徴とする請求項１０乃至１４のうちいずれか１項に記載の有機ＥＬ素子の製造方法。
【請求項２１】
前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項２０に記載の有機ＥＬ素子の製造方法。
【請求項２２】
前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されることを特徴とする請求項２０に記載の有機ＥＬ素子の製造方法。
【請求項２３】
基板に有機ＥＬ素子用第１電極を少なくとも２つ形成する工程と、
前記基板の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部を有する単位マスクを少なくとも２つ具備し、前記単位マスクの外側で他の

単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部を具備した有機膜形成用蒸着マスクを介在して、前記各単位マスクの主開口部を通じて少なくとも前記各第１電極を覆うように、有機発光物質を含む有機物で有効発光領域を含む有機膜を形成する工程と、

前記有機膜の上部に前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極を形成する工程と、

前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法。

【請求項２４】

前記有機膜形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項２３に記載の有機ＥＬ素子の製造方法。

【請求項２５】

前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されることを特徴とする請求項２３に記載の有機ＥＬ素子の製造方法。

【請求項２６】

前記第２電極の形成工程は、マスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する単位マスクを少なくとも２つ具備した第２電極形成用蒸着マスクを介在して、前記主開口部を通じて前記各有効発光領域の上部に第２電極ラインを含む第２電極を形成し、前記第１ダミー開口部を通じて前記各有効発光領域の外側に第２ダミーパターン領域を形成することを特徴とする請求項２３乃至２５のいずれか１項に記載の有機ＥＬ素子の製造方法。

【請求項２７】

前記第２電極形成用蒸着マスクは、前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置されることを特徴とする請求項２６に記載の有機ＥＬ素子の製造方法。

【請求項２８】

前記第２電極形成用蒸着マスクには、前記単位マスクの外側で他の単位マスクに隣接しない位置に前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わっていることを特徴とする請求項２６に記載の有機ＥＬ素子の製造方法。

【請求項２９】

前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項２８に記載の有機ＥＬ素子の製造方法。

【請求項３０】

前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されたことを特徴とする請求項２８に記載の有機ＥＬ素子の製造方法。

【請求項３１】

前記第２電極の形成工程は、マスクフレームにより引張力が加わるように支持され、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できる第２電極形成用蒸着マスクを介在してなされ、

前記第２電極形成用蒸着マスクの前記単位マスクの外側で他の単位マスクに隣接しない位置には、前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わっていることを特徴とする請求項２３乃至２５のいずれか１項に記載の有機ＥＬ素子の製造方法。

【請求項３２】

前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項３１に記載の有機ＥＬ素子の製造方法。

【請求項３３】

前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されることを特徴とする請求項３１に記載の有機ＥＬ素子の製造方法。

【請求項３４】

基板に所定パターンの第１電極を形成する工程と、

前記基板に形成された前記第１電極を覆うように、有機発光物質を含む有機物で有効発光領域を含む有機膜を形成する工程と、

前記有機膜の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する第２電極形成用蒸着マスクを介在して、前記主開口部を通じて前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極ラインを含む第２電極を形成し、前記第１ダミー開口部を通じて前記有効発光領域の外側に第２ダミーパターン領域を形成する工程と、

前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法。

【請求項３５】

前記第２電極形成用蒸着マスクには、前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置されることを特徴とする請求項３４に記載の有機ＥＬ素子の製造方法。

【請求項３６】

前記有機ＥＬ素子の製造方法は単一工程で少なくとも２つの有機ＥＬ素子を製造し、

前記第２電極形成用蒸着マスクは、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できるものであり、前記単位マスクの外側で他の単位マスクに隣接しない位置には、前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わっていることを特徴とする請求項３４に記載の有機ＥＬ素子の製造方法。

【請求項３７】

前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項３６に記載の有機ＥＬ素子の製造方法。

【請求項３８】

前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されたことを特徴とする請求項３６に記載の有機ＥＬ素子の製造方法。

【請求項３９】

基板に有機ＥＬ素子用第１電極を少なくとも２つ形成する工程と、

前記基板に形成された前記各第１電極を覆うように有機発光物質を含む有機物で有効発光領域を含む有機膜を形成する工程と、

前記有機膜の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部を有する単位マスクを少なくとも２つ具備し、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部を具備した第２電極形成用蒸着マスクを介在して、前記各単位マスクの主開口部を通じて前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極ラインを含む第２電極を形成する工程と、

前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法。
【請求項４０】
前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置することを特徴とする請求項３９に記載の有機ＥＬ素子の製造方法。
【請求項４１】
前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置されたことを特徴とする請求項３９に記載の有機ＥＬ素子の製造方法。
【請求項４２】
請求項１乃至９のいずれかに記載の蒸着マスクを使用して製造された有機ＥＬ素子であって、
基板と、
前記基板上に第１電極ラインと、前記蒸着マスクの主開口部により形成された、有機発光層を含む有機膜と、前記第１電極ラインと交差する第２電極ラインとが順次に備わって、前記第１及び第２電極ラインが互いに交差する部分で前記有機膜が発光する有効発光領域と、
前記有効発光領域の外側に前記基板の縁部に形成され、前記第１電極ラインの各ラインと連結される第１電極端子と、前記各第２電極ラインの各ラインと連結される第２電極端子とを有する端子部と、
前記端子部が露出されるように前記基板上に形成されて少なくとも前記有効発光領域を密封する密封部と、
前記蒸着マスクの第１及び／又は第２ダミー開口部により形成されたダミーパターンを有し、前記有効発光領域の外側に形成されたダミーパターン領域とを含むことを特徴とする有機ＥＬ素子。
【請求項４３】
前記ダミーパターン領域は前記有効発光領域と前記端子部との間に形成されることを特徴とする請求項４２に記載の有機ＥＬ素子。
【請求項４４】
前記ダミーパターン領域は前記密封部の内側に形成されることを特徴とする請求項４２に記載の有機ＥＬ素子。
【請求項４５】
前記ダミーパターン領域は前記有機発光層と同じ物質で形成されていることを特徴とする請求項４２乃至４４のいずれか１項に記載の有機ＥＬ素子。
【請求項４６】
前記ダミーパターン領域は前記有機膜と同じ物質で形成されていることを特徴とする請求項４２乃至４４のいずれか１項に記載の有機ＥＬ素子。
【請求項４７】
前記ダミーパターン領域は前記第２電極ラインと同じ物質で備わっていることを特徴とする請求項４２乃至４４のうちいずれか１項に記載の有機ＥＬ素子。
【請求項４８】
前記ダミーパターン領域は前記有機膜上部のうち前記有機発光領域の外側に形成されることを特徴とする請求項４７に記載の有機ＥＬ素子。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】
本発明は蒸着マスクに係り、より詳細には、引張力を加えた時にも開口部ピッチの精度を維持できる蒸着マスクと、これを利用した有機ＥＬ素子の製造方法及びこれにより製造された有機ＥＬ素子に関する。
【０００２】

【従来の技術】
有機ＥＬ素子（エレクトロルミネッセンス素子）は自発発光型表示素子であり、視野角が広くてコントラストが優秀なだけでなく応答速度が速いという長所があって、次世代表示素子として注目されている。
【０００３】
このような有機ＥＬ素子は、透明な絶縁基板上に所定パターンに形成された第１電極と、この第１電極が形成された絶縁基板上に真空蒸着法により形成された有機膜と、前記第１電極と交差する方向に前記有機膜の上面に形成された第２電極とを含む。
【０００４】
このように構成された有機ＥＬ素子を製作するにあって、前記第１電極は通常ＩＴＯ（Indium Tin Oxide）よりなるが、このＩＴＯのパターニングはフォトリソグラフィー法を使用して塩化第２鉄を含むエッチング液中で湿式エッチング法によりなされる。
【０００５】
ところで、前記フォトリソグラフィー法は有機膜が形成される前の段階では使用が可能であるが、有機膜が形成された後にはその使用に問題がある。すなわち、有機膜は水分に非常に弱くてその製造過程中にはもちろん製造後にも水分から徹底的に隔離しなければならないからである。従って、レジスト剥離過程及びエッチング過程で水分に露出される前記フォトリソグラフィー法は、有機膜及び第２電極層のパターニングに適していない。
【０００６】
このような問題点を解決するために、有機膜をなす有機発光材料及び第２電極層をなす材料は所定のパターンを有するマスクを利用して真空中で蒸着する方法を多く採用している。特に、前記第２電極層は所定の隔離壁であるカソードセパレータを利用してパターニングすることも出来るが、前記有機膜のうち低分子有機膜は蒸着マスクを利用して真空蒸着法によりパターニングすることが最も適していると知られている。
【０００７】
前記のようにマスクを利用して有機膜または第２電極層をパターニングする方法において、発光層の有機膜をパターニングする技術はフルカラー有機ＥＬ素子を製造するにおいて非常に重要な技術である。
【０００８】
従来公知のフルカラー有機ＥＬ素子のカラー化方式には、赤（Ｒ）、緑（Ｇ）、青（Ｂ）の各画素を基板上に独立蒸着させる三色独立蒸着方式、青色発光を発光源として色変換層を光取出面に設置する色変換方式（ＣＣＭ方式）、白色発光を発光源としてカラーフィルタを使用するカラーフィルタ方式などがある。このうち三色独立蒸着方式が単純な構造で優秀な色純度及び効率を示す点で最も注目されている方式である。
【０００９】
三色独立蒸着方式は、蒸着マスクを使用してＲ、Ｇ、Ｂの各画素を基板上に独立蒸着する方式であり、この時、前記蒸着マスクは熱膨張係数が低い材料を使用して熱変形を防止し、硫石部材として基板に密着させる時には磁性体でなければならないが、最も重要な因子は蒸着マスクの高精度である。特に、蒸着される各画素間の位置精度、すなわち、パターンの開口部幅の高精度が要求され、マスクトータルピッチの高精度が要求される。例えば、フルカラー有機ＥＬ素子に対して１３０ｐｐｉ以上の高精細化及び５０％以上の開口率が要求されるならば、蒸着マスクの開口部幅の偏差は±５μｍ以下、トータルピッチの偏差は±１０μｍ以下にしなければならない。
【００１０】
通常、有機ＥＬ素子の製造過程で有機膜または電極の蒸着に利用される蒸着マスクは、図１に示すようにフレーム２０に引張力が加わるように支持されるものであり、１つの金属薄板１１に１つの有機ＥＬ素子を蒸着できる単位マスク１２が複数個わっている。
【００１１】
前記蒸着マスク１０は板が薄くてパターンが微細なために、そのまま使用すれば撓みなどによる変形が発生して正確なパターニングができない。従って、図１に示す通り、前記蒸

着マスク１０は所定のトータルピッチＰｔの精度を満足するように図１でｘ軸及びｙ軸方向に最適の引張力を加えた後、マスクフレーム２０に接合させる。この接合時にはトータルピッチＰｔの精度を変化させないことが重要である。前記のような蒸着マスク１０とマスクフレーム２０との接合は多様な方法によりなされうるが、接着剤による接合やレーザー溶接あるいは抵抗溶接などを使用することが出来る。

【００１２】

一方、各単位マスク１２は所定パターンの開口部を具備するが、図１に示すように、ｙ軸方向に長く形成されたストライプ状の開口部を具備できる。ところで、このような各単位マスク１２の開口部のうち縁部の開口部は前記引張力により所定の精度が容易に維持されなくなる。

【００１３】

図２は、図１のＩ－Ｉ線断面図であり、各単位マスク１２に開口部１３が形成された状態を示す。図２に示すように、前記開口部１３の間には遮蔽部１４が備わり、縁部に位置した開口部１３ａは遮蔽部１４と単位マスクとのリブ１５により形成される。

【００１４】

ところで、このような開口部１３を有する蒸着マスク１０に図１のようにｘ軸及びｙ軸方向に引張力を加えれば、図２に示すように各単位マスク１２の縁部の開口部１３ａをなすリブ１５の端部１５ａが高さ方向に変形してしまう。このようなリブ１５の端部１５ａの変形は縁部の開口部１３ａの幅の精度を低下させ、これにより、この縁部の開口部１３ａにより蒸着される有機発光膜はその精度が低下し、パネルの外部領域で正確な有機発光膜のパターニングがなされなくなる問題が生じる。また、各単位マスクの間に位置したリブの端部が変形される場合、この部分が有機膜に接触してパネルの周辺部に暗点や画素ショートなどの欠陥を誘発させうる問題が生じる。

【００１５】

このような現象は、図３に示す通り、複数の単位マスクのうち最外側に位置した単位マスクに影響をさらに及ぼしてトータルピッチの精度を低下させる。

【００１６】

すなわち、図３に示す通り、複数の単位マスク１２のうち最外側に位置した単位マスク、特に、開口部１３の長手方向に対し直角方向に加わる引張力の方向、すなわち、ｘ軸方向の最外側に位置した単位マスク１２ａ、１２ｂはｘ軸方向の引張力により大きく変形し、これにより、一側の単位マスク１２ａの外側リブの端部を遮蔽した線１６ａと、他側の単位マスク１２ｂの外側リブの端部を遮蔽した線１６ｂとの間隔であるトータルピッチＰｔの精度はさらに狂ちて、各単位マスク１２のパターン形成の精度はさらに低下する。

【００１７】

特許文献１に、高精細パターニングに対応可能とした蒸着用スクリーンマスクが開示されている。開示されたマスクは、基板上に蒸着によるパターニング膜を形成する時に使われる蒸着用マスクであり、多数の第１開口部を区画した隔壁を有するマスク部、前記それぞれの開口面積が前記各第１開口部の開口面積より小さいさまざまな第２開口部を有し、前記さまざまな第２開口部が前記マスク部の前記各第１開口部上に配された磁性資料を含むスクリーン部を具備する。

【００１８】

特許文献２には、磁性体マスクの構造が開示されており、特許文献３には、被蒸着物に密着されて蒸着部分をマスキングするものとして、蒸着領域に対応するマスクパターンが形成された蒸着マスクフレームが、フレームの厚さに比べて所定の寸法を支持し難い微細な間隙及び微細パターン部を含むマスクパターンを具備し、前記マスクパターンの微細パターン部が微細リブにより支持された構造を有する。前述したようなマスクは、フレームに支持されたマスクが磁性体よりなって被蒸着物と密着されるようになっているが、これらの場合にも引張力の印加時の最外側開口部の変形による精度低下の問題は相変らず抱えている。

【００１９】

また、特許文献４には、蒸着過程でマスクが熱膨張して部分的に浮き上がり、これにより基板上に既に形成されている膜に損傷を与える問題を解決するためのものとして、マスクより大きく形成して段差部を具備しこの段差部に取り付ける支持部材を利用して成膜時にマスクが熱膨張されてもこの支持部材によりマスクが彼状に曲がらないようにし、また、成膜時に磁性部材がマスクの他面から基板に密着させてマスクと支持部材との間に間隔を作り、この間隔を利用してマスクを冷却させる効果を得るパターン形成装置が開示されている。

【００２０】

しかし、前記マスクの場合、スリットが備わったマスク部がフレームにより固定的に支持された構造では無いため、精密な位置制御には多少無理があり、特に、高精細並びに高精密のパターン形成のためにマスクを非常に薄く形成せねばならない有機ＥＬ素子の蒸着マスクにおいては、工程中に位置変形が発生する恐れがある。

【００２１】

特許文献５には、成膜過程でマスクが熱により熱膨張することを抑制するためのものとして、マスクを支持しているフレームの内部に流路を形成させて、この流路内部に冷却液を循環させるパターン形成装置が開示されているが、これもまた、フレームに固定させる過程で発生しうる引張力及び開口部精度の変化問題は見逃している。

【００２２】

特許文献６、特許文献７、特許文献８、特許文献９には、マスクとフレームとの間にマスク遮蔽部の撓みなどによる変形を防止するために補強線がさらに備わったメタルマスクが開示されているが、これらマスクの場合にも高精度パターンの形成のためにマスクに引張力を加えた後、フレームに固定させる場合には、また同様に寸法変化の問題が発生することがある。

【００２３】

[特許文献１]
特開２００１－２４７９６１公報
[特許文献２]
特開２００１－２７３９７６公報
[特許文献３]
特開２００１－２５４１６９公報
[特許文献４]
特開２００２－００９０９８公報
[特許文献５]
特開２００２－００８８５９公報
[特許文献６]
特開２０００－０４８９５４公報
[特許文献７]
特開２０００－１７３７６９公報
[特許文献８]
特開２００１－２０３０７９公報
[特許文献９]
特開２００１－１１０５６７公報

[発明が解決しようとする課題]

本発明は、前記のような問題点を解決するためのものであり、マスクにマスクフレームにより引張力を加えるように支持したことによって発生する恐れがある開口部幅の精度変化を減らしてパターンの偏差を減らしうる蒸着マスク、これを利用した有機ＥＬ素子の製造方法及びこれにより製造された有機ＥＬ素子を提供することにその目的がある。

【００２４】

本発明の他の目的は、マスクにマスクフレームにより引張力が加わった場合、トータルピッチを補正してパターン精度を向上させうる蒸着マスク、これを利用した有機ＥＬ素子

の製造方法及びこれにより製造された有機ＥＬ素子を提供することにある。

【００２５】

【課題を解決するための手段】

前記のような目的を達成するために、本発明は、薄板よりなってマスクフレームにより引張力が加わるように支持されたものであり、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する単位マスクを少なくとも１つ具備することを特徴とする蒸着マスクを提供する。

【００２６】

本発明の他の特徴によれば、前記主開口部は有効蒸着領域を形成するのに使われ、前記第１ダミー開口部は無効蒸着領域を形成するのに使われる。

【００２７】

本発明のさらに他の特徴によれば、前記第１ダミー開口部は少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置される。

【００２８】

本発明のさらに他の特徴によれば、前記単位マスクは少なくとも２つ備わり、前記単位マスク等の外側で他の単位マスクに隣接しない位置には、前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わる。

【００２９】

本発明のさらに他の特徴によれば、前記第２ダミー開口部は前記単位マスクが形成した有効蒸着領域の外側に位置する。

【００３０】

本発明のさらに他の特徴によれば、前記第２開口部は少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００３１】

本発明はまた、前記のような目的を達成するために、薄板よりなってマスクフレームにより引張力が加わるように支持されたものであり、少なくとも１つの主開口部を有する単位マスクを少なくとも２つ具備し、前記単位マスク等の外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部を具備することを特徴とする蒸着マスクを提供する。

【００３２】

本発明のさらに他の特徴によれば、前記各単位マスクの主開口部は有効蒸着領域を形成するのに使われ、前記第２ダミー開口部は前記単位マスクが形成した有効蒸着領域の外側に位置する。

【００３３】

本発明のさらに他の特徴によれば、前記第２ダミー開口部は少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００３４】

本発明はまた、前記のような目的を達成するために、基板に所定パターンの第１電極を形成する工程と、前記基板の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する有機膜形成用蒸着マスクを介在して、前記主開口部を通じて少なくとも有機発光物質を含む有機物で少なくとも有効発光領域を含む有機膜を、少なくとも前記第１電極を覆うように形成し、前記第１ダミー開口部を通じて前記有効発光領域の外側に第１ダミーパターン領域を形成する工程と、前記有機膜の上部に前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極を形成する工程と、前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法を提供する。

【００３５】
このような本発明の他の特徴によれば、前記有機膜形成用蒸着マスクは前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置される。
【００３６】
本発明のさらに他の特徴によれば、前記有機ＥＬ素子の製造は単一工程で少なくとも２つの有機ＥＬ素子を製造することであり、前記有機膜形成用蒸着マスクは少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の有機膜を蒸着できるものであり、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わる。
【００３７】
本発明のさらに他の特徴によれば、前記有機膜形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。
【００３８】
本発明のさらに他の特徴によれば、前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。
【００３９】
本発明のさらに他の特徴によれば、前記第２電極の形成工程はマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する第２電極形成用蒸着マスクを介在して、前記主開口部を通じて前記有効発光領域の上部に第２電極ラインを含む第２電極を形成し、前記第１ダミー開口部を通じて前記有効発光領域の外側に第２ダミーパターン領域を形成する。
【００４０】
本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクは、前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置される。
【００４１】
本発明のさらに他の特徴によれば、前記有機ＥＬ素子の製造は単一工程で少なくとも２つの有機ＥＬ素子を製造することであり、前記第２電極形成用蒸着マスクは少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できるものであり、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わる。
【００４２】
本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着する位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。
【００４３】
本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。
【００４４】
本発明のさらに他の特徴によれば、前記有機ＥＬ素子の製造は、単一工程で少なくとも２つの有機ＥＬ素子を製造することであり、前記第２電極の形成工程は、マスクフレームにより引張力が加わるように支持され、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できる第２電極形成用蒸着マスクを介在

してなされることであり、前記第２電極形成用蒸着マスクの前記単位マスクの外側で他の単位マスクに隣接しない位置には、前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わる。

【００４５】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。

【００４６】

本発明のさらに他の特徴によれば、前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００４７】

本発明はまた、前記のような目的を達成するために、基板に有機ＥＬ素子用第１電極を少なくとも２つ形成する工程と、前記基板の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部を有する単位マスクを少なくとも２つ具備し、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部を具備した有機膜形成用蒸着マスクを介在して、前記各単位マスクの主開口部を通じて少なくとも有機発光物質を含む有機物で、少なくとも有効発光領域を含む有機膜を少なくとも前記各第１電極を覆うように形成する工程と、前記有機膜の上部に前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極を形成する工程と、前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法を提供する。

【００４８】

このような本発明の他の特徴によれば、前記有機膜形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。

【００４９】

本発明のさらに他の特徴によれば、前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００５０】

本発明のさらに他の特徴によれば、前記第２電極の形成工程はマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する単位マスクを少なくとも２つ具備した第２電極形成用蒸着マスクを介在して、前記主開口部を通じて前記各有効発光領域の上部に第２電極ラインを含む第２電極を形成し、前記第１ダミー開口部を通じて前記各有効発光領域の外側に第２ダミーパターン領域を形成する。

【００５１】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクは、前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置される。

【００５２】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクには、前記単位マスクの外側で他の単位マスクに隣接しない位置に前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わる。

【００５３】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。

【００５４】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００５５】

本発明のさらに他の特徴によれば、前記第２電極の形成工程は、マスクフレームにより引張力が加わるように支持され、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できる第２電極形成用蒸着マスクを介在してなされることであり、前記第２電極形成用蒸着マスクの前記単位マスクの外側で他の単位マスクに隣接しない位置には、前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わる。

【００５６】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。

【００５７】

本発明のさらに他の特徴によれば、前記有機膜形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００５８】

本発明はまた、前記のような目的を達成するために、基板に所定パターンの第１電極を形成する工程と、前記基板に形成された前記第１電極を覆うように少なくとも有機発光物質を含む有機物で少なくとも有効発光領域を含む有機膜を形成する工程と、前記有機膜の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部と、前記マスクフレームにより引張力が加わった方向で最外側の主開口部に隣接する位置に形成された少なくとも１つの第１ダミー開口部とを有する第２電極形成用蒸着マスクを介在して、前記主開口部を通じて前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極ラインを含む第２電極を形成し、前記第１ダミー開口部を通じて前記有効発光領域の外側に第２ダミーパターン領域を形成する工程と、前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法を提供する。

【００５９】

本発明の他の特徴によれば、前記第２電極形成用蒸着マスクには、前記第１ダミー開口部が少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に隣接して設置される。

【００６０】

本発明のさらに他の特徴によれば、前記有機ＥＬ素子の製造は単一工程で少なくとも２つの有機ＥＬ素子を製造することであり、前記第２電極形成用蒸着マスクは、少なくとも２つの単位マスクを具備して前記各単位マスクが１つの有機ＥＬ素子の第２電極を蒸着できるものであり、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部が備わる。

【００６１】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。

【００６２】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００６３】

本発明はまた、前記のような目的を達成するために、基板に有機ＥＬ素子用第１電極を少なくとも２つ形成する工程と、前記基板に形成された前記各第１電極を覆うように少なくとも有機発光物質を含む有機物で少なくとも有効発光領域を含む有機膜を形成する工程と、前記有機膜の上部にマスクフレームにより引張力が加わるように支持され、少なくとも１つの主開口部を有する単位マスクを少なくとも２つ具備し、前記単位マスクの外側で他の単位マスクに隣接しない位置には前記単位マスクのうち前記マスクフレームにより引張力が加わった方向で最外側に位置した単位マスクに隣接して少なくとも１つの第２ダミー開口部を具備した第２電極形成用蒸着マスクを介在して、前記各単位マスクの主開口部を通じて前記第１電極と交差する部分で前記有効発光領域が形成されるように所定パターンの第２電極ラインを含む第２電極を形成する工程と、前記基板を密封する工程とを含むことを特徴とする有機ＥＬ素子の製造方法を提供する。

【００６４】

本発明の他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、最外側の単位マスクが蒸着される位置に隣接し、有機ＥＬ素子の有効発光領域の外側に位置する。

【００６５】

本発明のさらに他の特徴によれば、前記第２電極形成用蒸着マスクの第２ダミー開口部は、少なくとも、ストライプ状の前記主開口部の長手方向に直交する方向に前記単位マスクに隣接して設置される。

【００６６】

本発明はまた、前記のような目的を達成するために、上記いずれかに記載の蒸着マスクを使用して製造された有機ＥＬ素子であって、基板と、前記基板上に第１電極ラインと、前記蒸着マスクの主開口部により形成された、有機発光層を含む有機膜と、前記第１電極ラインと交差する第２電極ラインとが順次に積わって、前記第１及び第２電極ラインが互いに交差する部分で前記有機膜が発光する有効発光領域と、前記有効発光領域の外側に前記基板の縁部に形成され、前記第１電極ラインの各ラインと連結される第１電極端子と、前記各第２電極ラインの各ラインと連結される第２電極端子とを有する端子部と、前記端子部が露出されるように前記基板上に形成されて少なくとも前記有効発光領域を密封する密封部と、前記蒸着マスクの第１及び／又は第２ダミー開口部により形成されたダミーパターンを有し、前記有効発光領域の外側に形成されたダミーパターン領域とを含むことを特徴とする有機ＥＬ素子を提供する。

【００６７】

本発明の他の特徴によれば、前記ダミーパターン領域は前記有効発光領域と前記端子部との間に形成される。

【００６８】

本発明のさらに他の特徴によれば、前記ダミーパターン領域は前記密封部の内側に形成される。

【００６９】

本発明のさらに他の特徴によれば、前記ダミーパターン領域は前記有機発光層と同じ物質で形成される。

【００７０】

本発明のさらに他の特徴によれば、前記ダミーパターン領域は前記有機膜と同じ物質で形成される。

【００７１】

本発明のさらに他の特徴によれば、前記ダミーパターン領域は前記第２電極ラインと同じ物質で形成される。

【００７２】
本発明のさらに他の特徴によれば、前記ダミーパターン領域は前記有機膜上部のうち前記有機発光領域の外側に形成される。
【００７３】
【発明の実施の形態】
以下、添付した図面を参照して本発明による望ましい実施形態を詳細に説明する。
【００７４】
＜本実施形態の蒸着マスクの構成例＞
図４～図６には、本発明による蒸着マスクの一実施形態を示した。図４は本発明の望ましい一実施形態による蒸着マスクの斜視図であり、図５は図４のうち単位マスクに対する部分斜視図であり、図６は図５のII－II線断面図である。
【００７５】
図面を参照すれば、本発明の一実施形態による蒸着マスク２０は少なくとも１つの単位マスク２１を具備するが、図４に示すように、複数の単位マスク２１を具備して単一工程で複数の製品のパターニングを可能にする。このような蒸着マスク２０は磁性薄板よりなり、ニッケルまたはニッケルとコバルトとの合金もしくは鉄とニッケルとの合金で形成するが、望ましくは、微細パターンの形成が容易で、表面粗度が非常に良好なニッケル－コバルトの合金で形成できる。また、このマスク２０は、後述するように、所定パターンの開口部２１１、２１３を電鋳法により形成して微細なパターニング及び優秀な表面平滑性を得られる。前記ニッケルとコバルトとの合金はニッケル８５重量％とコバルト１５重量％であるが、他の重量比でも適用可能である。
【００７６】
このような蒸着マスク２０はもちろんエッチング法によっても製造できるが、フォトレジスト法を利用して開口部２１１、２１３のパターンを有するレジスト層を薄板に形成するか、開口部２１１、２１３のパターンを有するフィルムを薄板に付着した後、薄板をエッチングすることによって製造できる。
【００７７】
前記のように製造された蒸着マスク２０はその縁部がクランプや接着剤により固定された状態で、図４のｘ軸及びｙ軸方向に引張力を加えた後、マスクフレーム３０に接合する。この時、前記マスクフレーム３０は中空の形状で前記蒸着マスク２０の各単位マスク２１が形成された部分を除外した縁部を支持できるように形成される。接合方法には、接着剤による接合と、レーザー溶接、抵抗加熱溶接など多様な方法を適用できるが、精度変化などを考慮してレーザー溶接方法を使用できる。図４で図面符号３１はレーザー溶接による溶接箇所を示す。
【００７８】
また、図示されていないが、前記のように蒸着マスク２０をマスクフレーム３０に溶接する時に溶接不良による寸法精度変化の問題を解決するために、前記蒸着マスク２０とマスクフレーム３０との溶接部位の蒸着マスク２０の上部をカバーフレームで覆って溶接部位で浮き上がる現象を防止できる。
【００７９】
一方、前記蒸着マスク２０に備わった各単位マスク２１は、図５に示すようにパターニングされた複数の開口部２１１、２１３を具備し、これらの開口部２１１、２１３はストライプ状の遮蔽部２１２により形成される。図４及び図５に示された前記開口部２１１、２１３は互いに平行した直線状に延びた形状であるが、必ずこのパターンに限定されることではなく、その他に格子状、モザイク状など多様なパターンにも実施可能である。そして、各単位マスク２１の間にはリブ２２が位置して単位マスク２１の間に距離を維持させる。このリブ２２はｘ軸方向に配列された単位マスク２１を分離させる第１リブ２２１と、ｙ軸方向に配列された単位マスク２１を分離させる第２リブ２２２とに分類できる。
【００８０】
このような開口部２１１、２１３のうち、前記蒸着マスク２０に引張力が加わる方向に最

外側の開口部は第１ダミー開口部２１３となり、その内側は主開口部２１１となる。前記第１ダミー開口部２１３は、蒸着マスクに加わる引張力により各単位マスクの縁部近くで開口部が変形されることを防止するためのものである。図５では、前記主開口部２１１がｙ軸方向に延びたストライプ状であるため、ｙ軸方向への引張力よりはｘ軸方向への引張力により単位マスク２１のｘ軸方向の縁部に位置した開口部が変形されることがある。従って、前記第１ダミー開口部２１３は、主開口部２１１のうちｘ軸方向の引張力が加わる方向の最外側に位置した主開口部２１１の長手方向に直交する方向に隣接して設置される。この時、前記主開口部２１１は使用者が所望する所定パターンの蒸着を行わせる有効蒸着領域を形成するのに使われ、前記第１ダミー開口部２１３は使用者が所望する所定パターンの蒸着領域以外の無効蒸着領域を形成するのに使われる。

【００８１】

図６は、図５のII－II線断面図である。ｘ軸方向に単位マスク２１を分割する第１リブ２２１から第１遮蔽部２１２ａ、第２遮蔽部２１２ｂ、第３遮蔽部２１２ｃなどの遮蔽部２１２が順に形成されており、各遮蔽部２１２の間に第１主開口部２１１ａ、第２主開口部２１１ｂなどの主開口部２１１が順に形成されている。そして、前記第１リブ２２１と第１遮蔽部２１２ａとの間には第１ダミー開口部２１３が形成されている。

【００８２】

図６で、第１主開口部２１１ａの幅Ｗs1はその偏差が△Ｗs1になり、第２主開口部２１１ｂの幅Ｗs2はその偏差が△Ｗs2になる。△Ｗr1は第１遮蔽部２１２ａの幅Ｗr1の偏差をいう。そして、第１ダミー開口部２１３の幅ＷSDの偏差は△ＷSDである。

【００８３】

このような開口部幅を有する蒸着マスクに引張力を加えれば、図４及び図５でｘ軸方向への変形により縁部に位置した第１ダミー開口部２１３を形成する第１リブ２２１の端部２２１ａは、図７に示す通り、上側または下側に浮き上がり、これにより第１ダミー開口部２１３の幅ＷSDの偏差△ＷSDはさらに大きくなる。このように引張力を加えた後の全単位マスクの各開口部幅の偏差量について、複数のマスクの測定結果を図８に示した。図８において、Ａは電鋳法により製造された蒸着マスクの測定結果、Ｂはエッチング法により製造された蒸着マスクの測定結果である。通常、主開口部それぞれの幅の偏差は遮蔽部幅の偏差であるΔＷr1、ΔＷr2、ΔＷr3、…に依存するので、図８では、第１ダミー開口部２１３、第１主開口部２１１ａ及び第２主開口部２１１ｂの各開口部幅偏差であるΔＷSD、ΔＷs1及びΔＷs2を第１遮蔽部幅偏差であるΔＷr1で割って無次元化した後、これを百分率で示した。

【００８４】

図８に示すように、引張力が加わった後には第１リブ２２１の端部２２１ａの変形により第１ダミー開口部２１３の開口部幅偏差△ＷSDが第１遮蔽部幅偏差△Ｗr1より２５～７５％大きくなることが分かり、第１主開口部２１１ａ、第２主開口部２１１ｂの開口部幅偏差△Ｗs1、△Ｗs2は第１遮蔽部幅偏差△Ｗr1とほとんど一致することが分かる。また、いずれの単位マスクでも図８と同様の傾向が見られ、単位マスクの位置依存性は小さい。

【００８５】

従って、前記第１ダミー開口部２１３がｘ軸方向への引張力を受け止めるので、有効蒸着領域に蒸着させる主開口部２１１の変形を最小化でき、これにより蒸着されるパターンの高精度を得られる。

【００８６】

一方、前記のように各単位マスク２１の最外側縁部に第１ダミー開口部２１３が存在するので、トータルピッチＰｔは図９に示すように、ｘ軸方向の外側に位置した単位マスク２１ａの最外側の第１ダミー開口部２１３ａから内側に第１番目に位置した第１主開口部２１１ａまで追加する線Ｃ、Ｄ間の間隔で決まる。このトータルピッチＰｔの精度は、図１０Ａ及び図１０Ｂに示すように、トータルピッチＰｔに偏差ＰｔｍａｘーＰｔｍｉｎが存在し、図１０Ａ～図１０Ｃに示すように、ライン偏差△Ｘが発生する可能性があるので、トータルピッチの偏差だけでなくライン偏差も減らすように局部的に引張力を調節しなが

ら溶接しなければならない。

【００８７】

一方、前記のような第１ダミー開口部２１３は、図５に示すように、主開口部２１１と同幅の同じ形状に形成され、これに隣接した第１主開口部２１１ａとの間隔も主開口部２１１間の間隔と同一に形成できるが、必ずこれに限定されるものではなく、主開口部２１１のパターンに影響を及ぼさない限り、いかなる形状やパターンでも関係ない。例えば、図１１に示すように、第１ダミー開口部２１３の開口幅WSDを第１主開口部２１１ａの開口幅Ws1より小さくし、第１ダミー開口部２１３と第１主開口部２１１ａとを分割する第１遮蔽部２１２ａの幅Wr1を第１主開口部２１１ａと第２主開口部２１１ｂとを分割する第２遮蔽部２１２ｂの幅Ｗｒ２より大きく形成することもできる。図示されてはいないが、これ以外にも多様な形状が適用できる。

【００８８】

そして、前記第１ダミー開口部２１３は、図１２に示すように、各単位マスク２１の主開口部２１１が格子状のパターンを具備する場合にも同一に適用できる。ただし、この時には主開口部２１１の形状によってｘ軸方向への引張力だけでなく、ｙ軸方向への引張力も同じくパターンの精度に悪影響を及ぼすので、ｙ軸方向へも最外側の主開口部に隣接して第１ダミー開口部２１３を形成する。この第１ダミー開口部２１３は、図１３にも示されたように、単一の主開口部２１１を有する開放型単位マスク２１を具備した蒸着マスク２０にも適用できることはもちろんである。

【００８９】

一方、本発明の望ましいさらに他の一実施形態によれば、前記蒸着マスク２０のトータルピッチＰｔの精度を向上させるために、図１４に示すように、第２ダミー開口部２２を具備できる。図１４は、本発明の望ましいさらに他の一実施形態による第２ダミー開口部２２を具備した蒸着マスク２０であり、図１５はその平面図である。

【００９０】

図１４及び図１５に示すように、前記蒸着マスク２０は所定パターンの主開口部２１１を有する単位マスク２１を少なくとも２つ具備する。この単位マスク２１の外側には、前記単位マスクのうち引張力が加わる方向の最外側に位置した単位マスク２１ａ、２１ｂに隣接して少なくとも１つの第２ダミー開口部２２が備わる。

【００９１】

図１４に示すように、前記第２ダミー開口部２２は主開口部２１１がｙ軸方向に延びたストライプ状である場合、前記蒸着マスク２０の主開口部２１１がｘ軸方向に大きく変形されるので、トータルピッチＰｔはｘ軸方向に歪曲される。このようなトータルピッチＰｔの歪曲を防止するために単位マスク２１が備わった蒸着マスク２０の縁部、特に、ｘ軸方向の最外側に位置した単位マスク２１ａ、２１ｂの列に隣接して引張力により変形される第２ダミー開口部２２を形成する。従って、この第２ダミー開口部２２はｘ軸方向の引張力により変形され、この変形によってその内側に備わった主開口部２１１を変形なしにより安全に維持でき、結果的に、トータルピッチＰｔを補正する効果を得る。

【００９２】

前記第２ダミー開口部２２は、図１４及び図１５に示すように、主開口部２１１と同幅の同じ形状に形成できるが、必ずこれに限定されることではなく、主開口部２１１のパターンに影響を及ぼさない限りいかなる形状やパターンでも関係ない。また、隣接した最外側の単位マスク２１ａ、２１ｂ間の間隔も、使用者が所望する蒸着領域、すなわち、隣接した最外側の単位マスク２１ａ、２１ｂが蒸着させる有効蒸着領域に干渉しない範囲内で最大限前記隣接した最外側の単位マスク２１ａ、２１ｂに近くその外側に位置させうる。そして、この第２ダミー開口部２２は蒸着マスク２０の溶接箇所３１の内側に位置せねばならない。

【００９３】

一方、図１６に示すように、単位マスク２１が配置されている外側に蒸着される基板との位置合わせのためのアライメントマーク２３が形成されている場合には、このアライメン

トマーク２３も引張力による変形を防止できなければならない。このアライメントマーク２３が変形される場合には基板の蒸着時に基板との整列が合わなくなってトータルピッチの歪曲を誘発し、パターンの精度を高められない。

【００９４】

従って、前記アライメントマーク２３の内側及び外側に一対の第２ダミー開口部２２１、２２２を形成する。内側の第２ダミー開口部２２１はトータルピッチＰｔの歪曲を防止してパターン形成の精度を高めるためのものであり、外側の第２ダミー開口部２２２はアライメントマーク２３の変形を防止して蒸着時に基板と正確に整列させるためのものである。

【００９５】

前記第２ダミー開口部２２は、図１７に示すように、各単位マスク２１の主開口部２１１が格子状のパターンを具備する場合にも同一に適用できる。ただし、この時には、主開口部２１１の形状によってｘ軸方向の引張力だけでなく、ｙ軸方向の引張力も同一にトータルピッチＰｔの精度に悪影響を及ぼすので、ｙ軸方向にも最外側の主開口部に隣接して第２ダミー開口部２２を形成する。これは、図１８に示すように、単一の主開口部２１１を有する開放型単位マスク２１を具備した蒸着マスク２０にも同一に適用できることはもちろんである。

【００９６】

一方、図１４～図１８を参考して説明した第２ダミー開口部２２を有する蒸着マスク２０は、前述した第１ダミー開口部２１３を有さず、そのトータルピッチＰｔは最外側の単位マスクの外側の主開口部間の間隔になる。しかし、本発明の蒸着マスク２０はこれに限定されず、図１９に示すように、第１ダミー開口部２１３と第２ダミー開口部２２とが組み合わされた形態としても適用できることはもちろんである。また、このような第１ダミー開口部２１３と第２ダミー開口部２２との組合形態においては、前述したあらゆる実施形態を組み合わせることができる。

【００９７】

このように第１ダミー開口部２１３及び第２ダミー開口部２２を具備した蒸着マスク２０は、各単位マスク２１において、有効蒸着領域を蒸着させる主開口部の形状歪曲を防止し、トータルピッチの精度を向上させて高精度のパターン形成が可能になる。

【００９８】

＜本実施形態の蒸着マスクを使用した有機ＥＬ素子の製造手順例＞

次に、前記のような蒸着マスクを利用して有機ＥＬ素子を製造する方法を説明する。

【００９９】

図２０～図３０に、本発明による有機ＥＬ素子の製造方法を順次に示す。

【０１００】

有機ＥＬ素子を製造するために、図２０のように、上面に透明導電膜４３と金属導電膜４４とが積層された透明な基板４１を準備する。前記透明導電膜４３はＩＴＯで形成でき、金属導電膜４４はクロムで形成できる。そして、前記基板４１は透明なガラスやプラスチックなどを使用できるが、前記基板４１にこれら透明導電膜４３及び金属導電膜４４が形成される前に基板の平滑性を高め、不純元素の浸透を遮断するために前記基板４１にバッファ層４２をさらに具備できる。前記バッファ層４２はSiO_2で形成できる。前記基板４１は単一工程で少なくとも２つの有機ＥＬ素子を製造できる程度の大きさを有する基板を使用できる。

【０１０１】

次に、図２１に示すように、前記基板４１の上面に形成された金属導電膜４４を加工して第１、２電極端子になりうる電極外部端子４４１、４４２を各々形成する。図２１には単一工程の複数の有機ＥＬ素子を製造する場合を示したが、以下、説明の便宜のためにそのうち１つの有機ＥＬ素子の製造工程を中心に説明する。これは図２１で各素子間を切断することによって得られる。

【０１０２】

図２２Ａは、図２１のある有機ＥＬ素子に係る図面であり、図２２Ｂは、図２２ＡのIII－III線断面図である。図２２Ａ及び図２２Ｂに示すように、電極外部端子４４１、４４２は第１、２電極端子の形成のための土台であり、基板４１上には透明導電膜４３が露出されている状態である。

【０１０３】

次には、基板４１上に露出された透明導電膜をパターニングして、図２３Ａ及び図２３Ｂのように、第１、２電極端子５１、５２の電極内部端子４３１、４３２を形成し、第１電極端子５１と連結される所定パターンの透明導電ライン４３３を形成するが、前記透明導電ライン４３３が第１電極ライン６１になる。図２３Ｂは図２３のIV－IV線の断面図であり、図２３Ｃは図２３ＡのＶ－Ｖ線の断面図である。このような工程において前記透明導電膜のパターニングにはフォトリソグラフィー法を利用できる。

【０１０４】

その後、図２４Ａ及び図２４Ｂに示したように、第１電極ライン６１間に内部絶縁膜６４を形成する。図２４Ｂは図２４ＡのVI－VI線断面図である。前記内部絶縁膜６４はフォトレジストや感光性ポリイミドなどを使用してフォトリソグラフィー法で形成できる。

【０１０５】

この時、前記内部絶縁膜６４の形成と同時に、図示されていないが、キャップで密封されるように接着剤が塗布される箇所を中心に内側及び外側に遮断壁部をさらに形成でき、前記第１電極ライン６１と第２電極端子５２間の空間に外部絶縁膜を形成できる。この外部絶縁膜は、後述するように第２電極ラインを形成する時、この第２電極ラインと第２電極端子５２との連結部分での第２電極端子５２の段差により断線される問題を防止するためのものであり、外部絶縁膜の下部には接着力の向上のために前記透明導電膜としてバッファ層をさらに形成できる。また、有機発光膜及び第２電極ラインのパターン形成のためのセパレータや、前記内部絶縁膜の上部に、マスクによる有機膜の損傷を防止するための隔壁を同時に形成でき、接着剤が塗布される箇所に形成される遮蔽部を同時に形成することもできる。

【０１０６】

次に、このような基板に、図２５に示されたような蒸着装置を利用して有機膜を蒸着させる。図２５の蒸着装置は、真空で維持されるチャンバ９１内に有機膜を蒸着させる蒸着源９２を配置し、上部にマスクフレーム３０に支持された蒸着マスク２０を設置する。この蒸着マスク２０の上部に、前記のように第１電極ライン及び内部絶縁膜が形成された基板４１を安着させ、その上部に前記蒸着マスク２０が前記基板４１に密着されるようにマグネットユニット９３を設置する。

【０１０７】

前記のような蒸着装置を利用して、図２６Ａ～図２６Ｃに示すように、有機膜６３を蒸着する。この時、前記有機膜６３は有機ＥＬ素子に使われうる有機膜であればいずれも適用できるが、ホール輸送層、有機発光層、電子輸送層などが単一あるいは複合の構造で積層されて形成される。また、使用可能な有機材料もフタロシアニン（ＣｕＰｃ：ｃｏｐｐｅｒ ｐｈｔｈａｌｏｃｙａｎｉｎｅ）、Ｎ，Ｎ－ジ（ナフタレン－１－イル）－Ｎ，Ｎ’－ジフェニルーベンジジン（ＮＰＢ）、トリス－８－ヒドロキシキノリンアルミニウム（Ａｌｑ３）をはじめとして多様に適用可能である。また、前記有機膜６３はフルカラー有機ＥＬ素子である場合に、前記有機発光層を各画素のカラーに対応して多様なパターンに形成可能である。

【０１０８】

前記有機膜６３は、図２５に示された蒸着装置に蒸着マスク２０を介在することによって形成可能であるが、この時、前記蒸着マスク２０は、図４～図１９を参照して説明した本発明のあらゆる実施形態による蒸着マスク２０である。

【０１０９】

すなわち、図４～図１３に示したように、少なくとも１つの主開口部２１１と、引張力、特に、前記主開口部２１１の長手方向に直交する方向に加わる引張力の方向に最外側の主

開口部２１１ａに隣接する位置に形成された第１ダミー開口部２１３を有する有機膜形成用蒸着マスクを使用でき、また図１４～図１８に示したように、各有機ＥＬ素子を蒸着する単位マスクを少なくとも２つ具備する時、これら単位マスクの外側に、前述したように、主開口部２１１の長手方向に直交する方向に加わる引張力の方向に最外側の単位マスクに隣接する位置に形成された第２ダミー開口部２２を有する有機膜形成用蒸着マスクを使用することができる。更に、図１９に示すように、これらが組み合わされた形態として第１ダミー開口部２１３及び第２ダミー開口部２２を有する有機膜形成用蒸着マスクを使用することができる。

【０１１０】

このような有機膜形成用蒸着マスクを使用すれば、前記第１ダミー開口部２１３により、図２６Ｃに示したように、第１ダミーパターン領域７０が形成される。図２６Ｃは、図２６ＢのVIII部分の拡大断面図である。

【０１１１】

図２６Ａ～図２６Ｃに示すように、前記有機膜６３において、まず第１電極ライン６１及び内部絶縁層６４の上部にホール輸送層６３１が蒸着され、その上部にカラーパターンに合うようにＲ、Ｇ、Ｂ色の有機発光層６３２が蒸着される。この時、前記ホール輸送層６３１はパターンなしに全面蒸着され、有機発光層６３２はパターンをなす。図２６Ｃでは、前記のようにパターンを有する有機発光層６３２を、前述したような本発明による有機膜形成用蒸着マスクを利用して蒸着した。前記第１電極ライン６１の上部に形成されたＲ、Ｇ、Ｂ色の有機発光層６３２は、後述するように第２電極ラインと第１電極ラインとが交差する領域に該当して電源の印加によって発光するので、有効発光領域６０となる。

【０１１２】

図２６Ｃに示すように、Ｒ、Ｇ、Ｂ色の各有機発光層６３２を前述したように第１ダミー開口部を具備した有機膜形成用蒸着マスクを利用して蒸着する場合には、Ｒ、Ｇ、Ｂ色の各有機発光層６３２を蒸着する時に第１ダミー開口部により第２端子５２と第１電極ライン６１、すなわち、有効発光領域６０間にＲ、Ｇ、Ｂの各々に対するダミー有機発光層６３２ａがさらに蒸着され、これにより第１ダミーパターン領域７０が形成される。

【０１１３】

このような第１ダミーパターン領域７０は、もし、ホール輸送層６３１を図１３に示されたような有機膜形成用蒸着マスクを使用して蒸着した場合には、図２７に示すように、ダミーホール輸送層６３１ａまで具備する。この時、図示されてはいないが、図１３で第１ダミー開口部２１３の幅を調節すれば第１ダミーパターン領域７０に均一な高さで有機膜を蒸着することができる。

【０１１４】

前述したように第１ダミーパターン領域７０を形成させる有機膜形成用蒸着マスクが第２ダミー開口部を具備する場合には、トータルピッチの変化量を減らして有効発光領域、特に、有機発光層のパターン精度をさらに向上することができる。

【０１１５】

そして、このような第１ダミーパターン領域７０は、第１電極ラインと第２電極ラインとが交差する領域である有効発光領域６０の外側で第１電極ラインと第２電極ラインとが交差しない領域に形成されるので発光しない無効発光領域に該当し、このように第１ダミーパターン領域７０を形成できる有機膜形成用蒸着マスクを使用して蒸着することによって、有効発光領域６０内のパターン精度をさらに向上させる。

【０１１６】

前記のように、有機膜を蒸着した後には図２８Ａ及び図２８Ｂに示すように、前記第１電極ライン６１と直交するように第２電極ライン６２を有機膜６３の上部に所定パターンに蒸着する。第２電極としてはアルミニウムやカルシウムを用いることが出来る。前記第２電極ライン６２の蒸着は前記有機膜の蒸着と同じく、図２５のような蒸着装置で蒸着マスクを利用して行う。この時、前記第２電極ライン６２のパターニングは蒸着マスクが所定パターンを有することによってなされ、これ以外にもあらかじめパターン形成のためのセ

パレータを形成してから全面蒸着でパターンを形成することもできる。

【０１１７】

前記のように、第２電極ライン６２が蒸着マスクを利用してパターニングされる場合には、前記有機発光層を含む有機膜の蒸着と同じく、図４～図１９を参照して説明した第１ダミー開口部及び／または第２ダミー開口部を有する第２電極形成用蒸着マスクを使用してパターニングできる。その一例を図２９に示した。すなわち、前記第２電極ライン６２を所定パターンを有する主開口部２１１及び第１ダミー開口部２１３を有する、図４に示されたような蒸着マスク２０を利用して蒸着した場合には、第１電極ライン６１と第２電極ライン６２とが互いに交差して有機膜６３が発光する領域である有効発光領域６０の外側に第２ダミー電極ライン６２ａが蒸着され、この第２ダミー電極ライン６２ａが第２ダミーパターン領域７１となる。この第２ダミーパターン領域７１を形成する第２ダミー電極ライン６２ａには外部電源が供給される第２電極端子が連結されないので、前述した第１ダミーパターン領域７０と同様に発光しない無効発光領域になる。一方、図２９に示すように、前記第２ダミー電極ライン６２ａは前記有機膜６３の上部のうち有効発光領域６０の外側に形成して第１電極ライン６１と接触させないことが望ましい。

【０１１８】

このように、本発明の望ましい一実施形態では本発明の有機膜形成用蒸着マスクを使用して有機膜を蒸着し、第２電極ラインを第２電極形成用蒸着マスクを使用して蒸着する方法を説明したが、前記第２電極ラインは前記有機膜を、本発明による蒸着マスクであればいかなる蒸着マスクを使用しても蒸着できることはもちろんである。

【０１１９】

このように有機膜及び第２電極ラインの形成が完了すれば、図３０に示すように、密封のためのキャップ８１を基板４１に接合させて密封部８０にし、この密封部８０の外側に露出された第１端子５１と第２端子５２とにフレキシブルな印刷回路基板８２を連結して有機ＥＬ素子の組立てを完了する。このような密封において、このようにキャップを使用する方法以外に有機ＥＬ素子に適用できるいかなる密封方法も適用可能である。

【０１２０】

図３０に示すように、本実施形態による前記有機ＥＬ素子は、第１電極ライン６１と第２電極ライン６２との間に有機膜が配置された有効発光領域６０と、この有効発光領域６０の第１及び第２電極ライン６１、６２に各々電源を供給する第１及び第２電極端子５１、５２を含む端子部５０と、前記有効発光領域６０の外側、すなわち、前記有効発光領域６０と端子部５０との間に位置した第１ダミーパターン領域７０及び第２ダミーパターン領域７１とを含む。そのそれぞれの構成及び機能については図２０～図２９で詳細に説明したので、その詳細な説明は省略する。

【０１２１】

このように、本実施形態によれば、第１ダミー開口部及び／または第２ダミー開口部を有する蒸着マスクを利用して、無効発光領域に第１ダミーパターン部及び／または第２ダミーパターン部を有する有機ＥＬ素子を製造することによって、発光される有効発光領域のパターン精度をさらに向上させることができる。

【０１２２】

なお、上述した例では、パッシブマトリックスタイプの有機ＥＬ素子について説明したが、本発明はこれに限定されず、アクティブマトリックスタイプ等の様々な駆動タイプについて適用可能である。

【０１２３】

本明細書では、本発明を限定された実施形態を中心に説明したが、本発明の思想範囲内で多様な実施形態が可能である。そして説明されなかったが、均等な手段も本発明に含まれうる。従って、本発明の真の保護範囲は特許請求の範囲によって決まらねばならない。

【０１２４】

【発明の効果】

前記のような構成を有する本発明の蒸着マスク、これを利用した有機ＥＬ素子の製造方法

及びこれにより製造された有機ＥＬ素子によれば、次のような効果を得られる。

【０１２５】

第１に、使用者が蒸着する有効蒸着領域に対するパターン精度を向上させることができる。

【０１２６】

第２に、単一工程でいろいろな素子を同時に蒸着する場合にトータルピッチの精度を向上させて不良率を低下できる。

【０１２７】

第３に、蒸着マスクと基板との位置合わせを正確に行うことができる。

【０１２８】

第４に、有機ＥＬ素子に発光されない無効発光領域であるダミーパターン領域を形成することによって発光される有効発光領域の高精細化を図りうる。

【０１２９】

第５に、マスクにマスクフレームにより引張力を加えて支持した場合にそのパターン精度が低下することを防止できる。

【図面の簡単な説明】

【図１】 従来の蒸着マスクを示す分解斜視図である。

【図２】図１による蒸着マスクの部分断面図である。

【図３】図１による蒸着マスクの平面図である。

【図４】本発明の望ましい一実施形態による蒸着マスクの斜視図である。

【図５】図４による蒸着マスクの単位マスクを示す部分斜視図である。

【図６】図５のII－II線断面図である。

【図７】蒸着マスクに引張力を加えた場合に図５のII－II線断面図である。

【図８】本発明によるマスクの開口部の幅偏差量を示すグラフである。

【図９】図４による蒸着マスクの平面図である。

【図１０Ａ】図４による蒸着マスクのトータルピッチの偏差及びライン偏差を示す概略図である。

【図１０Ｂ】図４による蒸着マスクのトータルピッチの偏差及びライン偏差を示す概略図である。

【図１０Ｃ】図４による蒸着マスクのトータルピッチの偏差及びライン偏差を示す概略図である。

【図１１】本発明の望ましい他の一実施形態による蒸着マスクの単位マスクの一部を示す部分平面図である。

【図１２】本発明の望ましい更に他の一実施形態による蒸着マスクの平面図である。

【図１３】本発明の望ましい更に他の一実施形態による蒸着マスクの平面図である。

【図１４】本発明の望ましい更に他の一実施形態による蒸着マスクの斜視図である。

【図１５】図１４による蒸着マスクの平面図である。

【図１６】本発明の望ましい更に他の一実施形態による蒸着マスクの平面図である。

【図１７】本発明の望ましい更に他の一実施形態による蒸着マスクの平面図である。

【図１８】本発明の望ましい更に他の一実施形態による蒸着マスクの平面図である。

【図１９】本発明の望ましい更に他の一実施形態による蒸着マスクの平面図である。

【図２０】基板上に透明導電膜と金属導電膜とを形成した状態を示す断面図である。

【図２１】電極外部端子を形成し複数の有機ＥＬ素子を製造する場合を示す平面図である。

【図２２Ａ】図２１のある有機ＥＬ素子の平面図である。

【図２２Ｂ】図２１のある有機ＥＬ素子のIII－III断面図である。

【図２３Ａ】透明導電膜をパターニングした状態を示した平面図である。

【図２３Ｂ】透明導電膜をパターニングした状態を示した図２３AのIV－IV断面図である。

【図２３Ｃ】透明導電膜をパターニングした状態を示した図２３AのＶ－Ｖ断面図である

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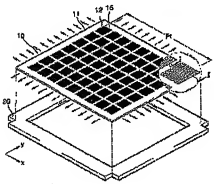
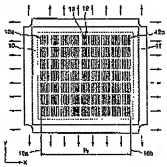
【図２４Ａ】内部絶縁膜を形成した状態を示す平面図である。
【図２４Ｂ】内部絶縁膜を形成した状態を示す図２４ＡのVI－VI断面図である。
【図２５】蒸着装置を利用して有機膜もしくは第２電極を蒸着している状態を示した図である。
【図２６Ａ】有機発光層を蒸着した状態を示した平面図である。
【図２６Ｂ】有機発光層を蒸着した状態を示した図２６ＡのVII－VII断面図である。
【図２６Ｃ】有機発光層を蒸着した状態を示した図２６ＢのVIIIの拡大図である。
【図２７】図１３の蒸着マスクを用いた場合に、ダミーホール輸送層を具備した状態を示した断面図である。
【図２８Ａ】第２電極を蒸着した状態を示した平面図である。
【図２８Ｂ】第２電極を蒸着した状態を示した図２８ＡのIX－IX断面図である。
【図２９】第２電極形成用蒸着マスクを使用してパターニングした一実施形態による有機ＥＬ素子の平面図である。
【図３０】本発明の望ましい一実施形態による有機ＥＬ素子の分解斜視図である。
【符号の説明】
２０　蒸着マスク
２１　単位マスク
３０　マスクフレーム
３１　蒸着マスクの溶接箇所

【図１】

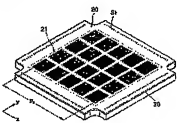


【図２】

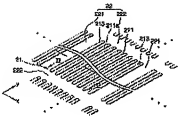
【図３】



【図４】



【図５】



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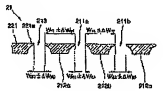

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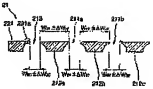

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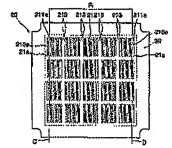

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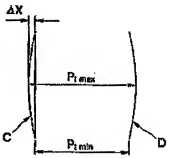

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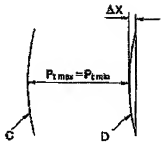

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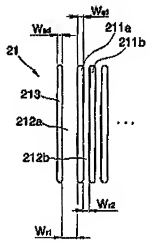

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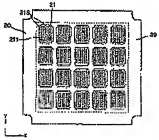

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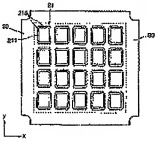

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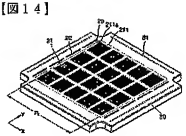

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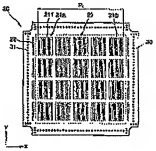

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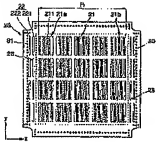

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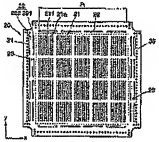

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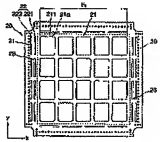

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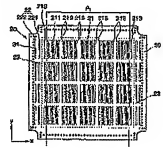

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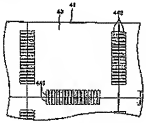

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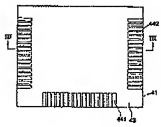

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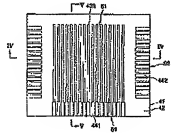

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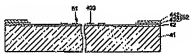

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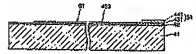

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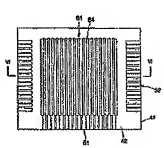

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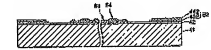

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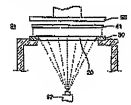

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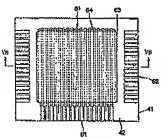

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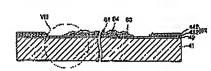

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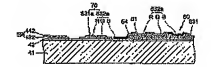

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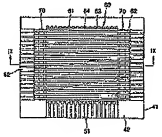

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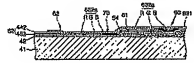

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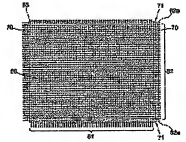

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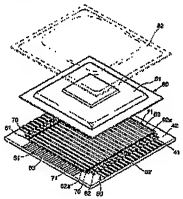

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(56)参考文献 特開２００２－２５２０８３（ＪＰ，Ａ）
特開２００２－０６９６１９（ＪＰ，Ａ）
特開２０００－０１２２３８（ＪＰ，Ａ）
特開２００２－０６０９２７（ＪＰ，Ａ）
特開２０００－１６０３２３（ＪＰ，Ａ）
特開平１０－００８２３９（ＪＰ，Ａ）

JP 4173722 Machine English Translation

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

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(57)[Claim(s)]
[Claim 1]
It is the deposition mask supported by mask frame so that it might consist of sheet metal and tensile force might be added,
A deposition mask possessing at least one unit mask characterized by comprising the following.
At least one astropyle part.
At least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame.

[Claim 2]
The deposition mask according to claim 1 which being used for said astropyle part forming an effective deposition area, and using for said 1st straw-man opening forming an invalid deposition area.
[Claim 3]
The deposition mask according to claim 2, wherein said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least and is installed.
[Claim 4]
In a position with which said at least two unit masks are equipped and which does not adjoin other unit masks on the outside of said unit mask. The deposition mask according to claim 1 or 2, wherein it adjoins a unit mask located in an outermost part in a direction to which tensile force was added by said mask frame among said unit masks and at least one 2nd straw-man opening is equipped.
[Claim 5]
The deposition mask according to claim 4, wherein said 2nd straw-man opening is located in the outside of an effective deposition area which said unit mask formed.
[Claim 6]
The deposition mask according to claim 4, wherein said 2nd straw-man opening adjoins said unit mask and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least.
[Claim 7]
It is the deposition mask supported by mask frame so that it might consist of sheet metal and tensile force might be added,
At least two unit masks which have at least one astropyle part are provided, A deposition mask adjoining a unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by

said mask frame among said unit masks, and providing at least one 2nd straw-man opening.
[Claim 8]
The deposition mask according to claim 7, wherein it is used for an astropyle part of each of said unit mask forming an effective deposition area and said 2nd straw-man opening is located in the outside of an effective deposition area which said unit mask formed.
[Claim 9]
The deposition mask according to claim 7, wherein said 2nd straw-man opening adjoins said unit mask and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least.
[Claim 10]
A process of forming the 1st electrode of a prescribed pattern in a substrate,
Are supported so that tensile force may be added to the upper part of said substrate by a mask frame, and At least one astropyle part, A deposition mask for organic layer formation which has at least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame is intervened, A process of forming an organic layer which includes an effective luminous region with an organic matter containing organic photogene so that said 1st electrode may be covered at least through said astropyle part, and forming the 1st dummy pattern field in the outside of said effective luminous region through said 1st straw-man opening,
A process of forming the 2nd electrode of a prescribed pattern so that said effective luminous region may be formed in the upper part of said organic layer in a portion which intersects said 1st electrode,
A manufacturing method of an organic EL device including a process of sealing said substrate.
[Claim 11]
A manufacturing method of the organic EL device according to claim 10, wherein said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least and said deposition mask for organic layer formation is installed.
[Claim 12]
A manufacturing method of said organic EL device manufactures at least two organic EL devices by a single process,
Said deposition mask for organic layer formation is that which possesses at least two unit masks and in which said each unit mask can vapor-deposit an organic layer of one organic EL device, In a position which does not adjoin other unit masks on the outside of said unit mask, among said unit masks, by said mask frame. A manufacturing method of the organic EL device according to claim 10, wherein it adjoins a unit mask located in an outermost part in a direction to which tensile force was added and at least one 2nd straw-man opening is equipped.
[Claim 13]
A manufacturing method of the organic EL device according to claim 12 by which the 2nd straw-man opening of said deposition mask for organic layer formation adjoining a position by which an outermost unit mask is vapor-deposited, and being located in the outside of an effective luminous region of an organic EL device.
[Claim 14]
A manufacturing method of the organic EL device according to claim 12, wherein the 2nd straw-man opening of said deposition mask for organic layer formation adjoins said unit mask and is installed at least towards intersecting perpendicularly with a longitudinal direction of said astropyle part of stripe shape.
[Claim 15]
A deposition mask for the 2nd electrode formation characterized by comprising the following is intervened, It is a manufacturing method of an organic EL device given in any 1 paragraph

among claims 10 thru/or 14 forming in the upper part of said effective luminous region the 2nd electrode including the 2nd electrode line through said astropyle part, and forming the 2nd dummy pattern field in the outside of said effective luminous region through said 1st straw-man opening.
It is supported so that tensile force may be added by a mask frame, and a formation process of said 2nd electrode is at least one astropyle part.
At least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame.

[Claim 16]
A manufacturing method of the organic EL device according to claim 15, wherein said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least and said deposition mask for the 2nd electrode formation is installed.
[Claim 17]
A manufacturing method of said organic EL device manufactures at least two organic EL devices by a single process,
Said deposition mask for the 2nd electrode formation is that which possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device, In a position which does not adjoin other unit masks on the outside of said unit mask, among said unit masks, by said mask frame. A manufacturing method of the organic EL device according to claim 15, wherein it adjoins a unit mask located in an outermost part in a direction to which tensile force was added and at least one 2nd straw-man opening is equipped.
[Claim 18]
A manufacturing method of the organic EL device according to claim 17 by which the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoining a position which an outermost unit mask vapor-deposits, and being located in the outside of an effective luminous region of an organic EL device.
[Claim 19]
A manufacturing method of the organic EL device according to claim 17, wherein the 2nd straw-man opening of said deposition mask for the 2nd electrode formation is adjoined and installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape by said unit mask at least.
[Claim 20]
A manufacturing method of said organic EL device manufactures at least two organic EL devices by a single process,
A formation process of said 2nd electrode should be supported so that tensile force is added by a mask frame, and intervene and do a deposition mask for the 2nd electrode formation which possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device,
In a position which does not adjoin other unit masks on the outside of said unit mask of said deposition mask for the 2nd electrode formation. It is a manufacturing method of an organic EL device given in any 1 paragraph among claims 10 thru/or 14, wherein it adjoins a unit mask located in an outermost part in a direction to which tensile force was added by said mask frame among said unit masks and at least one 2nd straw-man opening is equipped.
[Claim 21]
A manufacturing method of the organic EL device according to claim 20 by which the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoining a position by which an outermost unit mask is vapor-deposited, and being located in the outside of an effective luminous region of an organic EL device.

[Claim 22]
A manufacturing method of the organic EL device according to claim 20, wherein the 2nd straw-man opening of said deposition mask for organic layer formation is adjoined and installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape by said unit mask at least.
[Claim 23]
A process of forming 1st at least two electrode for organic EL devices in a substrate,
It is supported so that tensile force may be added to the upper part of said substrate by a mask frame, At least two unit masks which have at least one astropyle part are provided, A deposition mask for organic layer formation which adjoined a unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks, and possesses at least one 2nd straw-man opening is intervened, A process of forming an organic layer which includes an effective luminous region with an organic matter containing organic photogene so that said each 1st electrode may be covered at least through an astropyle part of each of said unit mask,
A process of forming the 2nd electrode of a prescribed pattern so that said effective luminous region may be formed in the upper part of said organic layer in a portion which intersects said 1st electrode,
A manufacturing method of an organic EL device including a process of sealing said substrate.
[Claim 24]
A manufacturing method of the organic EL device according to claim 23 by which the 2nd straw-man opening of said deposition mask for organic layer formation adjoining a position by which an outermost unit mask is vapor-deposited, and being located in the outside of an effective luminous region of an organic EL device.
[Claim 25]
A manufacturing method of the organic EL device according to claim 23, wherein the 2nd straw-man opening of said deposition mask for organic layer formation is adjoined and installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape by said unit mask at least.
[Claim 26]
A deposition mask for the 2nd electrode formation possessing at least two unit masks characterized by comprising the following is intervened, A manufacturing method of an organic EL device given in any 1 paragraph of claims 23 thru/or 25 forming in the upper part of each of said effective luminous region the 2nd electrode including the 2nd electrode line through said astropyle part, and forming the 2nd dummy pattern field in the outside of each of said effective luminous region through said 1st straw-man opening.
It is supported so that tensile force may be added by a mask frame, and a formation process of said 2nd electrode is at least one astropyle part.
At least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame.

[Claim 27]
A manufacturing method of the organic EL device according to claim 26, wherein said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least and said deposition mask for the 2nd electrode formation is installed.
[Claim 28]
In said deposition mask for the 2nd electrode formation. In a position which does not adjoin other unit masks on the outside of said unit mask, among said unit masks by said mask frame.

A manufacturing method of the organic EL device according to claim 26, wherein it adjoins a unit mask located in an outermost part in a direction to which tensile force was added and at least one 2nd straw-man opening is equipped.
[Claim 29]
A manufacturing method of the organic EL device according to claim 28 by which the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoining a position by which an outermost unit mask is vapor-deposited, and being located in the outside of an effective luminous region of an organic EL device.
[Claim 30]
A manufacturing method of the organic EL device according to claim 28, wherein the 2nd straw-man opening of said deposition mask for the 2nd electrode formation is adjoined and installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape by said unit mask at least.
[Claim 31]
A formation process of said 2nd electrode should be supported so that tensile force is added by a mask frame, and intervene and do a deposition mask for the 2nd electrode formation which possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device,
In a position which does not adjoin other unit masks on the outside of said unit mask of said deposition mask for the 2nd electrode formation. A manufacturing method of an organic EL device given in any 1 paragraph of claims 23 thru/or 25, wherein it adjoins a unit mask located in an outermost part in a direction to which tensile force was added by said mask frame among said unit masks and at least one 2nd straw-man opening is equipped.
[Claim 32]
A manufacturing method of the organic EL device according to claim 31 by which the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoining a position by which an outermost unit mask is vapor-deposited, and being located in the outside of an effective luminous region of an organic EL device.
[Claim 33]
A manufacturing method of the organic EL device according to claim 31, wherein the 2nd straw-man opening of said deposition mask for organic layer formation is adjoined and installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape by said unit mask at least.
[Claim 34]
A process of forming the 1st electrode of a prescribed pattern in a substrate,
A process of forming an organic layer which includes an effective luminous region with an organic matter containing organic photogene so that said 1st electrode formed in said substrate may be covered,
Are supported so that tensile force may be added to the upper part of said organic layer by a mask frame, and At least one astropyle part, A deposition mask for the 2nd electrode formation which has at least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame is intervened,
A process of forming the 2nd electrode including the 2nd electrode line of a prescribed pattern so that said effective luminous region may be formed in a portion which intersects said 1st electrode through said astropyle part, and forming the 2nd dummy pattern field in the outside of said effective luminous region through said 1st straw-man opening,
A manufacturing method of an organic EL device including a process of sealing said substrate.
[Claim 35]
A manufacturing method of the organic EL device according to claim 34, wherein said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal

direction of said astropyle part of stripe shape at least and is installed in said deposition mask for the 2nd electrode formation.
[Claim 36]
A manufacturing method of said organic EL device manufactures at least two organic EL devices by a single process,
Said deposition mask for the 2nd electrode formation is that which possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device, In a position which does not adjoin other unit masks on the outside of said unit mask. A manufacturing method of the organic EL device according to claim 34, wherein it adjoins a unit mask located in an outermost part in a direction to which tensile force was added by said mask frame among said unit masks and at least one 2nd straw-man opening is equipped.
[Claim 37]
A manufacturing method of the organic EL device according to claim 36 by which the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoining a position by which an outermost unit mask is vapor-deposited, and being located in the outside of an effective luminous region of an organic EL device.
[Claim 38]
A manufacturing method of the organic EL device according to claim 36, wherein the 2nd straw-man opening of said deposition mask for the 2nd electrode formation is adjoined and installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape by said unit mask at least.
[Claim 39]
A process of forming 1st at least two electrode for organic EL devices in a substrate,
A process of forming an organic layer which includes an effective luminous region with an organic matter which contains organic photogene so that said each 1st electrode formed in said substrate may be covered,
It is supported so that tensile force may be added to the upper part of said organic layer by a mask frame, At least two unit masks which have at least one astropyle part are provided, A deposition mask for the 2nd electrode formation which adjoined a unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks, and possesses at least one 2nd straw-man opening is intervened, A process of forming the 2nd electrode that includes the 2nd electrode line of a prescribed pattern so that said effective luminous region may be formed in a portion which intersects said 1st electrode through an astropyle part of each of said unit mask,
A manufacturing method of an organic EL device including a process of sealing said substrate.
[Claim 40]
A manufacturing method of the organic EL device according to claim 39 by which the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoining a position by which an outermost unit mask is vapor-deposited, and being located in the outside of an effective luminous region of an organic EL device.
[Claim 41]
A manufacturing method of the organic EL device according to claim 39, wherein the 2nd straw-man opening of said deposition mask for the 2nd electrode formation is adjoined and installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape by said unit mask at least.
[Claim 42]
It is the organic EL device manufactured using the deposition mask according to any one of claims 1 to 9,
A substrate,

An effective luminous region where said organic layer emits light in a portion to which the 1st electrode line, an organic layer which was formed of an astropyle part of said deposition mask, and containing an organic luminous layer, and the 2nd electrode line which intersects said 1st electrode line are equipped one by one, and said 1st and 2nd electrode line crosses mutually on said substrate,
A terminal area which has the 1st electrode terminal that is formed in an edge of said substrate at the outside of said effective luminous region, and is connected with each line of said 1st electrode line, and the 2nd electrode terminal connected with each line of each of said 2nd electrode line,
A seal part which is formed on said substrate and seals said effective luminous region at least so that said terminal area may be exposed,
An organic EL device including a dummy pattern field which has the dummy pattern formed of the 1st and/or the 2nd straw-man opening of said deposition mask, and was formed in the outside of said effective luminous region.
[Claim 43]
The organic EL device according to claim 42, wherein said dummy pattern field is formed between said effective luminous region and said terminal area.
[Claim 44]
The organic EL device according to claim 42, wherein said dummy pattern field is formed inside said seal part.
[Claim 45]
An organic EL device given in any 1 paragraph of claims 42 thru/or 44, wherein said dummy pattern field is formed by the same substance as said organic luminous layer.
[Claim 46]
An organic EL device given in any 1 paragraph of claims 42 thru/or 44, wherein said dummy pattern field is formed by the same substance as said organic layer.
[Claim 47]
It is an organic EL device given in any 1 paragraph among claims 42 thru/or 44, wherein said dummy pattern field is equipped by the same substance as said 2nd electrode line.
[Claim 48]
The organic EL device according to claim 47, wherein said dummy pattern field is formed in the outside of said organic luminous region among said organic layer upper parts.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to a deposition mask and it is related more with the deposition mask which can maintain the accuracy of an opening pitch also when tensile force is applied to details, and the manufacturing method of the organic EL device using this and the organic EL device manufactured by this.
[0002]
[Description of the Prior Art]
It is a spontaneous luminescence type display device, the angle of visibility of an organic EL device (electroluminescent element) is large, and has the strong point in which speed of response is quick, and contrast is not only excellent, but it attracts attention as a next-generation display device.
[0003]
Such an organic EL device contains the 1st electrode formed in the prescribed pattern on the

transparent insulating substrate, the organic layer formed by the vacuum deposition method on the insulating substrate in which this 1st electrode was formed, and the 2nd electrode formed in the upper surface of said organic layer in the direction which intersects said 1st electrode.
[0004]
Although it is in manufacturing the organic EL device constituted in this way and said 1st electrode usually consists of ITO(s) (Indium Tin Oxide), patterning of this ITO is made by a wet etching method in the etching reagent which contains ferric chloride using the photolithographic method.
[0005]
By the way, although said photolithographic method can be used in the stage before an organic layer is formed, after an organic layer is formed, there is a problem in the use. That is, it is because an organic layer is dramatically weak for moisture and must be thoroughly isolated from moisture also after manufacture, of course in the manufacturing process. Therefore, said photolithographic method exposed to moisture by the resist removing process and an etching process is not suitable for patterning of the organic layer and the 2nd electrode layer.
[0006]
In order to solve such a problem, the material which makes the organic luminescent material and the 2nd electrode layer which make an organic layer has adopted many methods of vapor-depositing in a vacuum using the mask which has a predetermined pattern. Although said especially 2nd electrode layer can also use and pattern the cathode separator which is a predetermined isolation wall, patterning a low molecule organic layer with a vacuum deposition method among said organic layers using a deposition mask is known as it is most suitable.
[0007]
In the method of patterning an organic layer or the 2nd electrode layer as mentioned above using a mask, the art which patterns the organic layer of a luminous layer is set to manufacture a full color organic EL device, and is very important art.
[0008]
To the publicly known colorization method of a full color organic EL device, conventionally. There are a 3 color independent vacuum evaporation method which carries out independent vacuum evaporation of each pixel of red (R) green (G) blue (B) on a substrate, a convert-colors method (CCM method) which installs a color conversion layer in an optical extraction side by making blue light into a light source, a light filter method which uses a light filter by making white light into a light source, etc. Among these, a 3 color independent vacuum evaporation method is a method which attracts attention most at the point which shows excellent color purity and efficiency with a simple structure.
[0009]
A 3 color independent vacuum evaporation method is a method which carries out independent vacuum evaporation of each pixel of R, G, and B on a substrate using a deposition mask. When said deposition mask prevents heat modification using material with a low coefficient of thermal expansion and it is made to stick to a substrate as a magnet member at this time, it must be a magnetic body, but the most important factor is the high degree of accuracy of a deposition mask.
The accuracy of position between each pixel vapor-deposited especially, i.e., the high degree of accuracy of the opening width of a pattern, is required, and the high degree of accuracy of a mask total pitch is required. For example, if highly-minute-izing of 130 or more ppi and the numerical aperture of not less than 50% are required from a full color organic EL device, the deviation of the opening width of a deposition mask must set the deviation of **5 micrometers or less and a total pitch to **10 micrometers or less.
[0010]
Usually, the deposition mask used for vacuum evaporation of an organic layer or an electrode

by the manufacturing process of an organic EL device is supported so that tensile force may be added to the frame 20, as shown in drawing 1.
The one metallic thin plate 11 is equipped with two or more unit masks 12 which can vapor-deposit one organic EL device.

[0011]
Since a board is thin and the pattern is detailed, modification by bending etc. will occur and said deposition mask 10 cannot perform exact patterning, if it is used as it is. Therefore, after said deposition mask 10 applies the optimal tensile force for a x axis and y shaft orientations by drawing 1 so that the accuracy of the predetermined total pitch Pt may be satisfied, it is joined to the mask frame 20, as shown in drawing 1. It is important not to change the accuracy of the total pitch Pt at the time of this junction. Although he does junction on the above deposition masks 10 and the mask frame 20 by various methods, junction, laser welding or resistance welding by adhesives, etc. can be used.
[0012]
On the other hand, although each unit mask 12 possesses the opening of a prescribed pattern, as shown in drawing 1, the opening of the stripe shape formed in y shaft orientations for a long time can be provided. By the way, as for the opening of an edge, predetermined accuracy is no longer easily maintained with said tensile force among the openings of such each unit mask 12.
[0013]
Drawing 2 is an I-I line sectional view of drawing 1.
The state where the opening 13 was formed is shown in each unit mask 12.
As shown in drawing 2, the shield part 14 is equipped between said openings 13, and the opening 13a located in the edge is formed of the rib 15 of the shield part 14 and a unit mask.
[0014]
By the way, if tensile force is applied to the deposition mask 10 which has such an opening 13 like drawing 1 in a x axis and y shaft orientations, the end 15a of the rib 15 which makes the opening 13a of the edge of each unit mask 12 as shown in drawing 2 will change into a height direction. Modification of the end 15a of such a rib 15 reduces the accuracy of the width of the opening 13a of an edge, thereby, that accuracy falls and the problem on which patterning of an exact organic luminescence film is no longer made in the external area of a panel produces the organic luminescence film vapor-deposited by the opening 13a of this edge. When the end of the rib located between each unit mask is changed, this portion contacts an organic layer and the problem which makes the periphery of a panel induce defects, such as scotoma and a pixel short circuit, and is sold to it arises.
[0015]
Such a phenomenon affects further the unit mask located in the outermost part among two or more unit masks, and reduces the accuracy of a total pitch as it is shown in drawing 3.
[0016]
Namely, the unit mask located in the outermost part among two or more unit masks 12 as shown in drawing 3, Especially the unit masks 12a and 12b located in the outermost part of the direction of the tensile force added to rectangular directions to the longitudinal direction of the opening 13, i.e., x shaft orientations, change greatly with the tensile force of x shaft orientations, and by this, The accuracy of the total pitch Pt which is an interval of the line 16a which connected the end of the outer rib of the unit mask 12a by the side of one, and the line 16b which connected the end of the outer rib of the unit mask 12b by the side of other falls further, and the accuracy of the pattern formation of each unit mask 12 falls further.
[0017]
The screen mask for vacuum evaporation whose correspondence in highly minute patterning was enabled at the patent documents 1 is indicated. The indicated mask is a mask for vapor

deposition used when forming the patterning film by vacuum evaporation on a substrate.
It has a mask part which has the septum which divided many 1st opening, and the 2nd various opening in which said each effective area product is smaller than the effective area product of each of said 1st opening, and the screen part containing the magnetic data in which said 2nd various opening was allotted on said each 1st opening of said mask part is provided.

[0018]
The structure of the magnetic body mask is indicated by the patent documents 2.
In the patent documents 3, as what is stuck by the thing to be vapor-deposited and masks a vacuum evaporation portion, The mask pattern in which the deposition mask frame in which the mask pattern corresponding to a deposition area was formed contains the detailed gap and minute pattern part which cannot support a predetermined size easily compared with the thickness of a frame is provided, and it has the structure where the minute pattern part of said mask pattern was supported with the minute rib.
Although a mask which was mentioned above consists of magnetic bodies and is stuck to the mask supported by the frame with a thing to be vapor-deposited, it has the problem of the accuracy reduction by modification of the outermost opening at the time of impression of tensile force as usual also in these cases.
[0019]
As a thing for solving the problem which does damage to the film which a mask expands thermally to the patent documents 4 in a vacuum evaporation process, comes floating to them selectively, and has already been formed on the substrate by this, Even if thermal expansion of the mask is carried out using the support member which forms more greatly than a mask, possesses a level difference part, and is attached to this level difference part at the time of membrane formation, a mask is kept from bending wavelike by this support member, At the time of membrane formation, a magnetic member makes it stick to a substrate from the other sides of a mask, and makes an interval between a mask and a support member, and the pattern formation device which acquires the effect of making a mask cooling using this interval is indicated.
[0020]
However, since it is not the structure where the mask part equipped with the slit was supported by the frame fixed in the case of said mask, precise position control has some unreasonableness and especially highly minute -- and -- high -- a mask must be formed very thinly for precise pattern formation -- in the deposition mask of an organic EL device, there is a possibility that position modification may occur in process.
[0021]
Although the pattern formation device which makes a channel form in the inside of the frame which is supporting the mask as a thing for controlling that a mask expands thermally with heat in a membrane formation process in the patent documents 5, and is made to circulate through cooling fluid inside this channel is indicated, The change problem of tensile force and opening accuracy that this may also be generated in the process made to fix to a frame is overlooked.
[0022]
In order to prevent modification by bending of a mask shield part etc. between a mask and a frame, the metal mask further equipped with the reinforcement wire is indicated by the patent documents 6, the patent documents 7, the patent documents 8, and the patent documents 9, but. When making it fix to a frame after applying tensile force to a mask for the formation of a highly precise pattern also to the case of these masks, the problem of a dimensional change may occur similarly.
[0023]
[Patent documents 1]

JP,2001-247961,A gazette
[Patent documents 2]
JP,2001-273976,A gazette
[Patent documents 3]
JP,2001-254169,A gazette
[Patent documents 4]
JP,2002-009098,A gazette
[Patent documents 5]
JP,2002-008859,A gazette
[Patent documents 6]
JP,2000-048954,A gazette
[Patent documents 7]
JP,2000-173769,A gazette
[Patent documents 8]
JP,2001-203079,A gazette
[Patent documents 9]
JP,2001-110567,A gazette
[Problem(s) to be Solved by the Invention]
The deposition mask which reduces accuracy change of the opening width which is for this invention solving the above problems, and has a possibility of generating by having supported so that tensile force might be applied to a mask by a mask frame, and can reduce the deviation of a pattern, The purpose is in providing the manufacturing method of the organic EL device using this, and the organic EL device manufactured by this.
[0024]
Other purposes of this invention are to provide the manufacturing method of the deposition mask in which a total pitch is amended, pattern accuracy is raised and it deals, and the organic EL device using this, and the organic EL device manufactured by this, when tensile force is added to a mask by a mask frame.
[0025]
[Means for Solving the Problem]
A deposition mask in order to attain the above purposes, wherein this invention possesses at least one unit mask characterized by comprising the following.
It is supported so that it may consist of sheet metal and tensile force may be added by a mask frame, and it is at least one astropyle part.
At least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame.

[0026]
According to other features of this invention, it is used for said astropyle part forming an effective deposition area, and is used for said 1st straw-man opening forming an invalid deposition area.
[0027]
According to the feature of further others of this invention, said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least, and is installed.
[0028]
According to the feature of further others of this invention, in a position with which said at least two unit masks are equipped and which does not adjoin other unit masks on the outsides, such as said unit mask. A unit mask located in an outermost part in a direction to which tensile force was added by said mask frame among said unit masks is adjoined, and at least one 2nd straw-

man opening is equipped.
[0029]
According to the feature of further others of this invention, said 2nd straw-man opening is located in the outside of an effective deposition area which said unit mask formed.
[0030]
According to the feature of further others of this invention, at least, said 2nd straw-man opening adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.
[0031]
This invention is supported so that it may consist of sheet metal and tensile force may be added by a mask frame, in order to attain the above purposes again,At least two unit masks which have at least one astropyle part are provided, A deposition mask adjoining a unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outsides, such as said unit mask, by said mask frame among said unit masks, and providing at least one 2nd straw-man opening is provided.
[0032]
According to the feature of further others of this invention, it is used for an astropyle part of each of said unit mask forming an effective deposition area, and said 2nd straw-man opening is located in the outside of an effective deposition area which said unit mask formed.
[0033]
According to the feature of further others of this invention, at least, said 2nd straw-man opening adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.
[0034]
A process of forming the 1st electrode of a prescribed pattern in a substrate in order that this invention may attain the above purposes again, Are supported so that tensile force may be added to the upper part of said substrate by a mask frame, and At least one astropyle part, A deposition mask for organic layer formation which has at least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame is intervened, An organic layer which includes an effective luminous region at least with an organic matter which contains organic photogene at least through said astropyle part, A process of forming so that said 1st electrode may be covered at least, and forming the 1st dummy pattern field in the outside of said effective luminous region through said 1st straw-man opening, A manufacturing method of an organic EL device including a process of forming the 2nd electrode of a prescribed pattern so that said effective luminous region may be formed in the upper part of said organic layer in a portion which intersects said 1st electrode, and a process of sealing said substrate is provided.
[0035]
According to other features of such this invention, said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least, and said deposition mask for organic layer formation is installed.
[0036]
According to the feature of further others of this invention, manufacture of said organic EL device is manufacturing at least two organic EL devices by a single process, Said deposition mask for organic layer formation is that which possesses at least two unit masks and in which said each unit mask can vapor-deposit an organic layer of one organic EL device, A unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks is adjoined, and at least one 2nd straw-man opening is equipped.
[0037]

According to the feature of further others of this invention, the 2nd straw-man opening of said deposition mask for organic layer formation adjoins a position by which an outermost unit mask is vapor-deposited, and is located in the outside of an effective luminous region of an organic EL device.

[0038]

According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for organic layer formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.

[0039]

According to the feature of further others of this invention, a formation process of said 2nd electrode is supported so that tensile force may be added by a mask frame, and At least one astropyle part, A deposition mask for the 2nd electrode formation which has at least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame is intervened, The 2nd electrode including the 2nd electrode line is formed in the upper part of said effective luminous region through said astropyle part, and the 2nd dummy pattern field is formed in the outside of said effective luminous region through said 1st straw-man opening.

[0040]

According to the feature of further others of this invention, said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least, and said deposition mask for the 2nd electrode formation is installed.

[0041]

According to the feature of further others of this invention, manufacture of said organic EL device is manufacturing at least two organic EL devices by a single process, Said deposition mask for the 2nd electrode formation is that which possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device, A unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks is adjoined, and at least one 2nd straw-man opening is equipped.

[0042]

According to the feature of further others of this invention, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins a position which an outermost unit mask vapor-deposits, and is located in the outside of an effective luminous region of an organic EL device.

[0043]

According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.

[0044]

According to the feature of further others of this invention, manufacture of said organic EL device, By a single process, are at least two organic EL devices manufacturing, and a formation process of said 2nd electrode, It is intervening and making a deposition mask for the 2nd electrode formation which is supported so that tensile force's may be added by a mask frame, and possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device, A unit mask located in an outermost part in a direction to which tensile force was added by said mask frame among said unit masks is adjoined, and a position which does not adjoin other unit masks on the outside of said unit mask of said deposition mask for the 2nd electrode formation is equipped with at least one 2nd straw-man

opening.
[0045]
According to the feature of further others of this invention, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins a position by which an outermost unit mask is vapor-deposited, and is located in the outside of an effective luminous region of an organic EL device.
[0046]
According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for organic layer formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.
[0047]
A process of forming 1st at least two electrode for organic EL devices in a substrate in order that this invention may attain the above purposes again, It is supported so that tensile force may be added to the upper part of said substrate by a mask frame, At least two unit masks which have at least one astropyle part are provided, A deposition mask for organic layer formation which adjoined a unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks, and possesses at least one 2nd straw-man opening is intervened, With an organic matter which contains organic photogene at least through an astropyle part of each of said unit mask. A process of forming an organic layer which includes an effective luminous region at least so that said each 1st electrode may be covered at least, A manufacturing method of an organic EL device including a process of forming the 2nd electrode of a prescribed pattern so that said effective luminous region may be formed in the upper part of said organic layer in a portion which intersects said 1st electrode, and a process of sealing said substrate is provided.
[0048]
According to other features of such this invention, the 2nd straw-man opening of said deposition mask for organic layer formation adjoins a position by which an outermost unit mask is vapor-deposited, and is located in the outside of an effective luminous region of an organic EL device.
[0049]
According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for organic layer formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.
[0050]
According to the feature of further others of this invention, a formation process of said 2nd electrode is supported so that tensile force may be added by a mask frame, and At least one astropyle part, A deposition mask for the 2nd electrode formation possessing at least two unit masks which have at least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame is intervened, The 2nd electrode including the 2nd electrode line is formed in the upper part of each of said effective luminous region through said astropyle part, and the 2nd dummy pattern field is formed in the outside of each of said effective luminous region through said 1st straw-man opening.
[0051]
According to the feature of further others of this invention, said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least, and said deposition mask for the 2nd electrode formation is installed.
[0052]

According to the feature of further others of this invention, to said deposition mask for the 2nd electrode formation. A unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks is adjoined, and at least one 2nd straw-man opening is equipped.

[0053]

According to the feature of further others of this invention, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins a position by which an outermost unit mask is vapor-deposited, and is located in the outside of an effective luminous region of an organic EL device.

[0054]

According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.

[0055]

According to the feature of further others of this invention, a formation process of said 2nd electrode, It is intervening and making a deposition mask for the 2nd electrode formation which is supported so that tensile force's may be added by a mask frame, and possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device, A unit mask located in an outermost part in a direction to which tensile force was added by said mask frame among said unit masks is adjoined, and a position which does not adjoin other unit masks on the outside of said unit mask of said deposition mask for the 2nd electrode formation is equipped with at least one 2nd straw-man opening.

[0056]

According to the feature of further others of this invention, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins a position by which an outermost unit mask is vapor-deposited, and is located in the outside of an effective luminous region of an organic EL device.

[0057]

According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for organic layer formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.

[0058]

This invention intervenes a deposition mask for the 2nd electrode formation characterized by comprising the following, in order to attain the above purposes again, The 2nd electrode that includes the 2nd electrode line of a prescribed pattern so that said effective luminous region may be formed in a portion which intersects said 1st electrode through said astropyle part is formed, A manufacturing method of an organic EL device including a process of forming the 2nd dummy pattern field in the outside of said effective luminous region through said 1st straw-man opening, and a process of sealing said substrate.

A process of forming the 1st electrode of a prescribed pattern in a substrate.

A process of forming an organic layer which includes an effective luminous region at least with an organic matter which contains organic photogene at least so that said 1st electrode formed in said substrate may be covered.

It is supported so that tensile force may be added to the upper part of said organic layer by a mask frame, and it is at least one astropyle part.

At least one 1st straw-man opening formed in a position which adjoins an astropyle part outermost in a direction to which tensile force was added by said mask frame.

[0059]
According to other features of this invention, said 1st straw-man opening adjoins in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape at least, and is installed in said deposition mask for the 2nd electrode formation.
[0060]
According to the feature of further others of this invention, by a single process, manufacture of said organic EL device is at least two organic EL devices manufacturing, and said deposition mask for the 2nd electrode formation, It is that which possesses at least two unit masks and in which said each unit mask can vapor-deposit the 2nd electrode of one organic EL device, A unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks is adjoined, and at least one 2nd straw-man opening is equipped.
[0061]
According to the feature of further others of this invention, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins a position by which an outermost unit mask is vapor-deposited, and is located in the outside of an effective luminous region of an organic EL device.
[0062]
According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.
[0063]
A process of forming 1st at least two electrode for organic EL devices in a substrate in order that this invention may attain the above purposes again, A process of forming an organic layer which includes an effective luminous region at least with an organic matter which contains organic photogene at least so that said each 1st electrode formed in said substrate may be covered, It is supported so that tensile force may be added to the upper part of said organic layer by a mask frame, At least two unit masks which have at least one astropyle part are provided, A deposition mask for the 2nd electrode formation which adjoined a unit mask located in an outermost part in a direction in which tensile force was added to a position which does not adjoin other unit masks on the outside of said unit mask by said mask frame among said unit masks, and possesses at least one 2nd straw-man opening is intervened, A manufacturing method of an organic EL device including a process of forming the 2nd electrode that includes the 2nd electrode line of a prescribed pattern so that said effective luminous region may be formed in a portion which intersects said 1st electrode through an astropyle part of each of said unit mask, and a process of sealing said substrate is provided.
[0064]
According to other features of this invention, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins a position by which an outermost unit mask is vapor-deposited, and is located in the outside of an effective luminous region of an organic EL device.
[0065]
According to the feature of further others of this invention, at least, the 2nd straw-man opening of said deposition mask for the 2nd electrode formation adjoins said unit mask, and is installed in the direction which intersects perpendicularly with a longitudinal direction of said astropyle part of stripe shape.
[0066]
A seal part in which this invention is formed on said substrate so that a terminal area and said

terminal area may be exposed, and it seals said effective luminous region at least, It has the dummy pattern formed of the 1st and/or the 2nd straw-man opening of said deposition mask.An organic EL device manufactured by one of the above using a deposition mask of a statement in order it is characterized by comprising the following and to attain the above purposes to an organic EL device including a dummy pattern field formed in the outside of said effective luminous region.
Substrate.
It is the 1st electrode line on said substrate.
An organic layer which was formed of an astropyle part of said deposition mask and containing an organic luminous layer.
An effective luminous region where said organic layer emits light in a portion with which the 2nd electrode line which intersects said 1st electrode line is equipped one by one, and which said 1st and 2nd electrode line intersects mutually, The 1st electrode terminal that is formed in an edge of said substrate at the outside of said effective luminous region, and is connected with each line of said 1st electrode line, and the 2nd electrode terminal connected with each line of each of said 2nd electrode line.

[0067]
According to other features of this invention, said dummy pattern field is formed between said effective luminous region and said terminal area.
[0068]
According to the feature of further others of this invention, said dummy pattern field is formed inside said seal part.
[0069]
According to the feature of further others of this invention, said dummy pattern field is formed by the same substance as said organic luminous layer.
[0070]
According to the feature of further others of this invention, said dummy pattern field is formed by the same substance as said organic layer.
[0071]
According to the feature of further others of this invention, said dummy pattern field is formed by the same substance as said 2nd electrode line.
[0072]
According to the feature of further others of this invention, said dummy pattern field is formed in the outside of said organic luminous region among said organic layer upper parts.
[0073]
[Embodiment of the Invention]
Hereafter, with reference to the attached drawing, the desirable embodiment by this invention is described in detail.
[0074]
<The example of composition of the deposition mask of this embodiment>
One embodiment of the deposition mask by this invention was shown in drawing 4 - drawing 6. Drawing 4 is a perspective view of the deposition mask by one desirable embodiment of this invention, drawing 5 is a fragmentary perspective view to a unit mask among drawing 4, and drawing 6 is an II-II line sectional view of drawing 5.
[0075]
If drawings are referred to, although the deposition mask 20 by one embodiment of this invention possesses at least one unit mask 21, as shown in drawing 4, it will possess two or more unit masks 21, and will enable patterning of two or more products by a single process. Although such a deposition mask 20 consists of magnetic thin plates and it forms with the alloy

of nickel or nickel, and cobalt, or the alloy of iron and nickel, desirably, formation of a minute pattern is easy and surface roughness can form with the alloy of very good nickel cobalt. This mask 20 forms the openings 211 and 213 of a prescribed pattern with electroforming, and can acquire detailed patterning and excellent surface smoothness so that it may mention later. Although the alloys of said nickel and cobalt are 85 % of the weight of nickel, and 15 % of the weight of cobalt, other weight ratios are applicable.

[0076]

Although such a deposition mask 20 can be manufactured also with an etching method, of course, After adhering the film which forms in sheet metal the regist layer which has a pattern of the openings 211 and 213 using the photoresist method, or has a pattern of the openings 211 and 213 to sheet metal, it can manufacture by etching sheet metal.

[0077]

The deposition mask 20 manufactured as mentioned above is in the state where the edge was fixed by a clamp or adhesives, and after it applies tensile force to the x axis and y shaft orientations of drawing 4, it is joined to the mask frame 30. At this time, said mask frame 30 is formed so that the edge which excepted the portion in which each unit mask 21 of said deposition mask 20 was formed in shape in the air can be supported. Although various methods, such as junction by adhesives, laser welding, resistance heating welding, are applicable to a joining method, a laser welding method can be used in consideration of accuracy change etc. The drawing numerals 31 show the welded place by laser welding by drawing 4.

[0078]

In order to solve the problem of the dimensional accuracy change by a poor weld when welding the deposition mask 20 to the mask frame 30 as mentioned above although not illustrated, The phenomenon of covering the upper part of the deposition mask 20 of the welding area of said deposition mask 20 and the mask frame 30 by a cover frame, and coming floating in a welding area can be prevented.

[0079]

On the other hand, each unit mask 21 with which said deposition mask 20 was equipped possesses two or more openings 211 and 213 patterned as shown in drawing 5, and these openings 211 and 213 are formed of the shield part 212 of stripe shape. Although said openings 211 and 213 shown in drawing 4 and drawing 5 are the shape prolonged in the mutually parallel linear shape, they are not certainly limited to this pattern, in addition are feasible also to various patterns, such as the shape of a lattice, and mosaic shape. And the rib 22 is located between each unit mask 21, and distance is maintained between the unit masks 21. This rib 22 can be classified into the 1st rib 221 into which the unit mask 21 arranged in x shaft orientations is made to divide, and the 2nd rib 222 into which the unit mask 21 arranged in y shaft orientations is made to divide.

[0080]

An outermost opening turns into the 1st straw-man opening 213, and the inside becomes in the direction in which tensile force is added to said deposition mask 20 among such openings 211 and 213 with the astropyle part 211. It is to prevent an opening from the tensile force added to a deposition mask being changed near the edge of each unit mask by said 1st straw-man opening 213. In drawing 5, since said astropyle part 211 is the stripe shape prolonged in y shaft orientations, the opening located in the edge of x shaft orientations of the unit mask 21 with the tensile force to x shaft orientations rather than the tensile force to y shaft orientations may be changed. Therefore, said 1st straw-man opening 213 adjoins in the direction which intersects perpendicularly with the longitudinal direction of the astropyle part 211 located in the outermost part of the direction to which the tensile force of x shaft orientations is added among the astropyle parts 211, and is installed. At this time, it is used for said astropyle part 211 forming the effective deposition area which makes the prescribed pattern for which a user asks vapor-

deposit, and is used for said 1st straw-man opening 213 forming invalid deposition areas other than the deposition area of the prescribed pattern for which a user asks.

[0081]

Drawing 6 is an II-II line sectional view of drawing 5. From the 1st rib 221 to the 1st shield part 212a that divides the unit mask 21 into x shaft orientations. The shield parts 212, such as the 2nd shield part 212b and the 3rd shield part 212c, are formed in order, and the astropyle parts 211, such as the 1st astropyle part 211a and the 2nd astropyle part 211b, are formed in order between each shield part 212. And the 1st straw-man opening 213 is formed between said 1st rib 221 and the 1st shield part 212a.

[0082]

By drawing 6, the deviation is set to deltaWs1 width Ws1 of the 1st astropyle part 211a, and, as for width Ws2 of the 2nd astropyle part 211b, the deviation is set to deltaWs2. deltaWr1 says the deviation of width Wr1 of the 1st shield part 212a. And the deviation of the width WSD of the 1st straw-man opening 213 is deltaWSD.

[0083]

If tensile force is applied to the deposition mask which has such opening width, the end 221a of the 1st rib 221 that forms the 1st straw-man opening 213 located in the edge according to the modification to x shaft orientations by drawing 4 and drawing 5, It comes floating to the upper part or the bottom, and, thereby, deviation deltaWSD of the width WSD of the 1st straw-man opening 213 becomes still larger as shown in drawing 7. Thus, about the deviation amount of each opening width of all the unit masks after applying tensile force, the measurement result of two or more masks was shown in drawing 8. In drawing 8, the measurement result of the deposition mask with which A was manufactured by electroforming, and B are the measurement results of the deposition mask manufactured by the etching method. Usually, since it depends for the deviation of the width of each astropyle part on delta Wr1, delta Wr2, delta Wr3, and -- which are the deviations of shield part width, in drawing 8. After dividing delta WSD, delta Ws1, and delta Ws2 which are each opening width deviation of the 1st straw-man opening 213, the 1st astropyle part 211a, and the 2nd astropyle part 211b by deltaWr1 which is the 1st shield part width deviation and forming them into a-less dimension, percentage showed this.

[0084]

It turns out that opening width deviation deltaWSD of the 1st straw-man opening 213 becomes large 25 to 75% from 1st shield part width deviation deltaWr1 according to modification of the end 221a of the 1st rib 221 after tensile force is added, as shown in drawing 8, It turns out that the opening width deviations delta Ws1 and delta Ws2 of the 1st astropyle part 211a and the 2nd astropyle part 211b are almost in agreement with 1st shield part width deviation deltaWr1. The same tendency as drawing 8 is seen with any unit mask, and the positional dependence of a unit mask is small.

[0085]

Therefore, since said 1st straw-man opening 213 catches the tensile force to x shaft orientations, modification of the astropyle part 211 which an effective deposition area is made to vapor-deposit can be minimized, and the high degree of accuracy of the pattern vapor-deposited by this can be obtained.

[0086]

On the other hand, since the 1st straw-man opening 213 exists in the outermost edge of each unit mask 21 as mentioned above, The total pitch Pt is decided the interval between the lines C and D connected to the 1st astropyle part 211a located in the 1st inside from the outermost 1st straw-man opening 213a of the unit mask 21a located in the outside of x shaft orientations, as shown in drawing 9. Since line deviation **X may generate the accuracy of this total pitch Pt as are shown in drawing 10 A and drawing 10 B, and deviation Ptmax-Ptmin exists in the total pitch Pt and it is shown in drawing 10 A - drawing 10 C, It must weld adjusting tensile force locally so

that not only the deviation of a total pitch but a line deviation may be reduced.
[0087]
On the other hand, as shown in drawing 5, the above 1st straw-man openings 213 are formed in the shape where the astropyle part 211 and the width are the same, and can also form identically to the interval between the astropyle parts 211 an interval with the 1st astropyle part 211a which adjoined this, but. Unless the pattern of the astropyle part 211 instead of what is certainly limited to this is affected, any shape or patterns are not related, either. For example, as shown in drawing 11, aperture width WSD of the 1st straw-man opening 213 is made smaller than aperture width Ws1 of the 1st astropyle part 211a, Width Wr1 of the 1st shield part 212a that divides the 1st straw-man opening 213 and the 1st astropyle part 211a can also be formed more greatly than width Wr2 of the 2nd shield part 212b that divides the 1st astropyle part 211a and the 2nd astropyle part 211b. Although not illustrated, shape various besides this is applicable.
[0088]
And said 1st straw-man opening 213 can be identically applied, also when the astropyle part 211 of each unit mask 21 possesses a lattice-like pattern, as shown in drawing 12. However, since not only the tensile force to x shaft orientations but the tensile force to y shaft orientations similarly has an adverse effect on the accuracy of a pattern with the shape of the astropyle part 211 at this time, y shaft orientations are also adjoined at an outermost astropyle part, and the 1st straw-man opening 213 is formed. This 1st straw-man opening 213 of it being applicable also to the deposition mask 20 possessing the open sand mold unit mask 21 which has the single astropyle part 211 is natural as shown also in drawing 13.
[0089]
On the other hand, according to other one embodiments in which this invention is desirable, in order to raise the accuracy of the total pitch Pt of said deposition mask 20, as shown in drawing 14, the 2nd straw-man opening 22 can be provided. It is the deposition mask 20 possessing the 2nd straw-man opening 22 by other one embodiments in which this invention of drawing 14 is desirable, and drawing 15 is the top view.
[0090]
As shown in drawing 14 and drawing 15, said deposition mask 20 possesses at least two unit masks 21 which have the astropyle part 211 of a prescribed pattern. The unit masks 21a and 21b located in the outermost part of the direction to which tensile force is added among said unit masks are adjoined, and the outside of this unit mask 21 is equipped with at least one 2nd straw-man opening 22.
[0091]
Since the astropyle part 211 of said deposition mask 20 is greatly transformed into x shaft orientations by said 2nd straw-man opening 22 when the astropyle part 211 is the stripe shape prolonged in y shaft orientations as shown in drawing 14, the total pitch Pt is distorted in x shaft orientations. In order to prevent distortion of such a total pitch Pt, the edge of the deposition mask 20 equipped with the unit mask 21 and the 2nd straw-man opening 22 which adjoin the sequence of the unit masks 21a and 21b especially located in the outermost part of x shaft orientations and by which tensile force is changed are formed. Therefore, the tensile force of x shaft orientations is changed by this 2nd straw-man opening 22, the astropyle part 211 with which that inside was equipped according to this modification can be maintained have [no modification] more safely, and the effect which amends the total pitch Pt is acquired as a result.
[0092]
Said 2nd straw-man opening 22 can be formed in the shape where the astropyle part 211 and the width are the same as shown in drawing 14 and drawing 15, but it is not certainly limited to this, and unless the pattern of the astropyle part 211 is affected, any shape or patterns are not related, either. The deposition area where a user asks also for the adjoining outermost unit

mask 21a and the interval between 21b, That is, you make it closely located in the outside on the outermost unit masks 21a and 21b which carried out the maximum aforementioned contiguity, and it gets within limits which do not interfere in the effective deposition area which the adjoining outermost unit masks 21a and 21b make vapor-deposit. And this 2nd straw-man opening 22 must be located inside the welded place 31 of the deposition mask 20.
[0093]
On the other hand, as shown in drawing 16, when the alignment mark 23 for alignment with the substrate vapor-deposited by the outside by which the unit mask 21 is arranged is formed, this alignment mark 23 must also be able to prevent modification by tensile force. When this alignment mark 23 is transformed, alignment with a substrate stops suiting at the time of vacuum evaporation of a substrate, distortion of a total pitch is induced, and accuracy of a pattern is not raised.
[0094]
Therefore, the 2nd straw-man openings 221 and 222 of a couple are formed in the inside and the outside of said alignment mark 23. It is for the inside 2nd straw-man opening's 221 preventing distortion of the total pitch Pt, and raising the accuracy of pattern formation, and is for the outside 2nd straw-man opening's 222 preventing modification of the alignment mark 23, and aligning it correctly with a substrate at the time of vacuum evaporation.
[0095]
Said 2nd straw-man opening 22 can be identically applied, also when the astropyle part 211 of each unit mask 21 possesses a lattice-like pattern, as shown in drawing 17. However, at this time, since not only the tensile force of x shaft orientations but the tensile force of y shaft orientations has an adverse effect on the accuracy of the total pitch Pt identically with the shape of the astropyle part 211, an outermost astropyle part is adjoined and the 2nd straw-man opening 22 is formed also in y shaft orientations. This of it being identically applicable also to the deposition mask 20 possessing the open sand mold unit mask 21 which has the single astropyle part 211 is natural as shown in drawing 18.
[0096]
The deposition mask 20 which, on the other hand, has the 2nd straw-man opening 22 which consulted and explained drawing 14 - drawing 18 does not have the 1st straw-man opening 213 mentioned above, but the total pitch Pt becomes an interval between the astropyle parts of the outside of an outermost unit mask. However, as the deposition mask 20 of this invention is not limited to this but it is shown in drawing 19, of course, it is applicable also as a gestalt with which the 1st straw-man opening 213 and the 2nd straw-man opening 22 were combined. In the union gestalt of such a 1st straw-man opening 213 and the 2nd straw-man opening 22, all the embodiments mentioned above are combinable.
[0097]
Thus, the deposition mask 20 possessing the 1st straw-man opening 213 and the 2nd straw-man opening 22 prevents the geometric distortion music of the astropyle part which makes an effective deposition area vapor-deposit in each unit mask 21, the accuracy of a total pitch is raised, and highly precise pattern formation becomes possible.
[0098]
<The example of a manufacture procedure of the organic EL device which uses the deposition mask of this embodiment>
Next, how to manufacture an organic EL device using the above deposition masks is explained.
[0099]
The manufacturing method of the organic EL device by this invention is shown in drawing 20 - drawing 30 one by one.
[0100]
In order to manufacture an organic EL device, the transparent substrate 41 with which the

transparent conducting film 43 and the metal conducting film 44 were laminated by the upper surface is prepared like drawing 20. Said transparent conducting film 43 can be formed by ITO, and can form the metal conducting film 44 with chromium. And although said substrate 41 can use transparent glass, a plastic, etc., in order to improve the smooth nature of a substrate and to intercept osmosis of an impure element before these transparent conducting films 43 and the metal conducting film 44 are formed in said substrate 41, the buffer layer 42 can be further provided in said substrate 41. Said buffer layer 42 can be formed by SiO_2. Said substrate 41 can use the substrate which has a size of the grade which can manufacture at least two organic EL devices by a single process.

[0101]

Next, as shown in drawing 21, the electrode external terminals 441 and 442 which process the metal conducting film 44 formed in the upper surface of said substrate 41, and can turn into the 1st and 2 electrode terminal are formed respectively. Although the case where two or more organic EL devices of a single process were manufactured was shown in drawing 21, it explains focusing on the manufacturing process of one organic EL device of them hereafter for the facilities of explanation. This is obtained by cutting between each element by drawing 21.

[0102]

Drawing 22 A is a drawing concerning an organic EL device with drawing 21, and drawing 22 B is an III-III line sectional view of drawing 22 A. As shown in drawing 22 A and drawing 22 B, the electrode external terminals 441 and 442 are the foundations for formation of the 1st and 2 electrode terminal, and it is in the state where the transparent conducting film 43 is exposed on the substrate 41.

[0103]

Although the transparent conducting film exposed on the substrate 41 is patterned next, the electrode inner terminals 431 and 432 of the 1st and 2 electrode terminals 51 and 52 are formed and the transparent electric conduction line 433 of the prescribed pattern connected with the 1st electrode terminal 51 is formed like drawing 23 A and drawing 23 B, Said transparent electric conduction line 433 turns into the 1st electrode line 61. Drawing 23 B is a sectional view of the IV-IV line of drawing 23, and drawing 23 C is a sectional view of the V-V line of drawing 23 A. The photolithographic method can be used for patterning of said transparent conducting film in such a process.

[0104]

Then, as shown in drawing 24 A and drawing 24 B, the inner insulating film 64 is formed between the 1st electrode lines 61. Drawing 24 B is a VI-VI line sectional view of drawing 24 A. Said inner insulating film 64 can be formed with the photolithographic method using photoresist, photosensitive polyimide, etc.

[0105]

At this time, simultaneously with formation of said inner insulating film 64, although not illustrated, an interception wall can be further formed in the inside and the outside centering on the part where adhesives are applied so that it may be sealed with a cap, and an external insulator layer can be formed in said 1st electrode line 61 and the space between the 2nd electrode terminal 52. It is for this external insulator layer preventing the problem disconnected with the level difference of the 2nd electrode terminal 52 in the joining segment of this 2nd electrode line and 2nd electrode terminal 52, when forming the 2nd electrode line so that it may mention later, A buffer layer can be further formed in the lower part of an external insulator layer as said transparent conducting film for improvement in adhesive strength. The septum for preventing damage to an organic layer with a mask can be simultaneously formed in the separator for the pattern formation of an organic luminescence film and the 2nd electrode line, and the upper part of said inner insulating film, and the shield part formed in the part where adhesives are applied can also be formed simultaneously.

[0106]
Next, such a substrate is made to vapor-deposit an organic layer using an evaporation apparatus as shown in drawing 25. The evaporation apparatus of drawing 25 arranges the deposition source 92 which makes an organic layer vapor-deposit and deals in it in the chamber 91 maintained under vacuum, and installs the deposition mask 20 supported by the mask frame 30 in the upper part. Safe arrival of the substrate 41 with which the 1st electrode line and the inner insulating film were formed in the upper part of this deposition mask 20 as mentioned above is carried out, and the magnet unit 93 is installed so that it may be stuck to said deposition mask 20 by said substrate 41 in that upper part.
[0107]
Using the above evaporation apparatus, as shown in drawing 26 A - drawing 26 C, the organic layer 63 is vapor-deposited. If it is an organic layer by which said organic layer 63 is used for an organic EL device and in which it deals at this time, all are applicable, but a hole transporting bed, an organic luminous layer, an electron transport layer, etc. are laminated and formed with a single or compound structure. Usable organic materials Phthalocyanine (CuPc:copper phthalocyanine), It is applicable to Oshi including N,N-JI (naphthalene-1-yl)-N,N'-diphenyl-benzidine (NPB) and tris-8-hydroxy kino RINARU minium (Alq3). Said organic layer 63 can form said organic luminous layer in various patterns corresponding to the color of each pixel, when it is a full color organic EL device.
[0108]
Although said organic layer 63 can be formed by placing the deposition mask 20 between the evaporation apparatus shown in drawing 25, said deposition mask 20 is the deposition mask 20 by all the embodiments of this invention explained with reference to drawing 4 - drawing 19 at this time.
[0109]
As shown in drawing 4 - drawing 13, namely, at least one astropyle part 211, The deposition mask for organic layer formation which has the 1st straw-man opening 213 formed in the position which adjoins in the tensile force and tensile force direction added in the direction which intersects perpendicularly with the longitudinal direction of said astropyle part 211 especially at the outermost astropyle part 211a can be used, As shown in drawing 14 - drawing 18, when at least two unit masks which vapor-deposit each organic EL device are provided, as mentioned above on the outside of these unit mask, The deposition mask for organic layer formation which has the 2nd straw-man opening 22 formed in the position which adjoins an outermost unit mask can be used in the tensile force direction added in the direction which intersects perpendicularly with the longitudinal direction of the astropyle part 211. As shown in drawing 19, the deposition mask for organic layer formation which has the 1st straw-man opening 213 and the 2nd straw-man opening 22 can be used as a gestalt with which these were combined.
[0110]
If such a deposition mask for organic layer formation is used, as shown in drawing 26 C, the 1st dummy pattern field 70 will be formed of said 1st straw-man opening 213. Drawing 26 C is an expanded sectional view of the VIII portion of drawing 26 B.
[0111]
As shown in drawing 26 A - drawing 26 C, in said organic layer 63, the hole transporting bed 631 is first vapor-deposited by the 1st electrode line 61 and the upper part of the internal insulating layer 64, and the organic luminous layer 632 of R, G, and B color is vapor-deposited so that a color pattern may be suited in the upper part. At this time, said hole transporting bed 631 is completely vapor-deposited without a pattern, and the organic luminous layer 632 makes a pattern. In drawing 26 C, the organic luminous layer 632 which has a pattern as mentioned above was vapor-deposited using the deposition mask for organic layer formation by this invention which was mentioned above. Since the organic luminous layer 632 of R and G which

were formed in the upper part of said 1st electrode line 61, and B color corresponds to the field to which the 2nd electrode line and the 1st electrode line cross and emits light by impression of a power supply so that it may mention later, it serves as the effective luminous region 60.

[0112]

In vapor-depositing using the deposition mask for organic layer formation possessing the 1st straw-man opening as are shown in drawing 26 C, and each organic luminous layer 632 of R, G, and B color was mentioned above, When vapor-depositing each organic luminous layer 632 of R, G, and B color, the straw-man organic luminous layer [as opposed to / to the 2nd terminal 52 and the 1st electrode line 61 / each of R, G, and B to between the effective luminous regions 60] 632a is further vapor-deposited by the 1st straw-man opening, and thereby, the 1st dummy pattern field 70 is formed.

[0113]

When the hole transporting bed 631 is vapor-deposited using the deposition mask for organic layer formation as shown in drawing 13, such a 1st dummy pattern field 70 is provided to the dummy hole transporting bed 631a, as shown in drawing 27. Although not illustrated at this time, if the width of the 1st straw-man opening 213 is adjusted by drawing 13, an organic layer can be vapor-deposited in uniform height to the 1st dummy pattern field 70.

[0114]

As mentioned above, when the deposition mask for organic layer formation in which the 1st dummy pattern field 70 is made to form possesses the 2nd straw-man opening, the variation of a total pitch can be reduced and an effective luminous region, especially the pattern accuracy of an organic luminous layer can be improved further.

[0115]

And such a 1st dummy pattern field 70, It corresponds to the invalid luminous region which does not emit light since it is formed in the field to which the 1st electrode line and the 2nd electrode line do not cross on the outside of the effective luminous region 60 which is a field where the 1st electrode line and the 2nd electrode line cross, Thus, by vapor-depositing using the deposition mask for organic layer formation which can form the 1st dummy pattern field 70, the pattern accuracy in the effective luminous region 60 is raised further, and it gets.

[0116]

As mentioned above, as it is shown in drawing 28 A and drawing 28 B after vapor-depositing an organic layer, the 2nd electrode line 62 is vapor-deposited to a prescribed pattern in the upper part of the organic layer 63 so that it may intersect perpendicularly with said 1st electrode line 61. Aluminum and calcium can be used as the 2nd electrode. An evaporation apparatus like drawing 25 performs vacuum evaporation of said 2nd electrode line 62 as well as vacuum evaporation of said organic layer using a deposition mask. At this time, the patterning of said 2nd electrode line 62 can also form a pattern by complete vacuum evaporation, after a deposition mask is made by having a prescribed pattern and forms the separator for pattern formation beforehand besides this.

[0117]

As mentioned above, when the 2nd electrode line 62 is patterned using a deposition mask. It can pattern using the deposition mask for the 2nd electrode formation which has the 1st straw-man opening and/or the 2nd straw-man opening which were explained with reference to drawing 4 - drawing 19 as well as vacuum evaporation of the organic layer containing said organic luminous layer. The example was shown in drawing 29. . Namely, have the astropyle part 211 which has a prescribed pattern for said 2nd electrode line 62, and the 1st straw-man opening 213. When it vapor-deposits using the deposition mask 20 as shown in drawing 4, The 2nd straw-man electrode line 62a is vapor-deposited by the outside of the effective luminous region 60 which is a field where the 1st electrode line 61 and the 2nd electrode line 62 cross mutually, and the organic layer 63 emits light, and this 2nd straw-man electrode line 62a serves

as the 2nd dummy pattern field 71. Since the 2nd electrode terminal in which an external power is supplied to the 2nd straw-man electrode line 62a which forms this 2nd dummy pattern field 71 is not connected, it becomes the 1st dummy pattern field 70 mentioned above and an invalid luminous region which does not emit light similarly. As for said 2nd straw-man electrode line 62a, as shown in drawing 29 on the other hand, it is desirable to form in the outside of the effective luminous region 60 among the upper parts of said organic layer 63, and not to make the 1st electrode line 61 contact.

[0118]

Thus, although one desirable embodiment of this invention explained how to vapor-deposit an organic layer using the deposition mask for organic layer formation of this invention, and vapor-deposit the 2nd electrode line using the deposition mask for the 2nd electrode formation, As for said 2nd electrode line, it is needless to say that it can vapor-deposit no matter what deposition mask it may use, if it is a deposition mask according said organic layer to this invention.

[0119]

Thus, if formation of an organic layer and the 2nd electrode line is completed, as shown in drawing 30, The cap 81 for seal is joined to the substrate 41, it is made the seal part 80, the flexible printed circuit board 82 is connected with the 1st terminal 51 and the 2nd terminal 52 which were exposed to the outside of this seal part 80, and an assembly of an organic EL device is completed. In such seal, any sealing methods applicable to an organic EL device in addition to the method of using a cap in this way are applicable.

[0120]

As shown in drawing 30, said organic EL device by this embodiment is provided with the following.

The effective luminous region 60 where the organic layer has been arranged between the 1st electrode line 61 and the 2nd electrode line 62.

The terminal area 50 containing the 1st and 2nd electrode terminals 51 and 52 that supply a power supply to the 1st and 2nd electrode lines 61 and 62 of this effective luminous region 60 respectively.

The outside 70 of said effective luminous region 60, i.e., the 1st dummy pattern field located between said effective luminous region 60 and the terminal area 50, the 2nd dummy pattern field 71.

Since drawing 20 - drawing 29 explained the composition and function in detail, the detailed explanation is omitted. [each]

[0121]

Thus, according to this embodiment, the deposition mask which has the 1st straw-man opening and/or the 2nd straw-man opening is used, By manufacturing the organic EL device which has the 1st dummy pattern part and/or the 2nd dummy pattern part in an invalid luminous region, the pattern accuracy of the effective luminous region which emits light can be raised further.

[0122]

In the example mentioned above, although the passive matrix type organic EL device was explained, this invention is not limited to this but can be applied to various drive types, such as an active-matrix type.

[0123]

Although this specification explained focusing on the embodiment which had this invention limited, various embodiments are possible at thought within the limits of this invention. And although not explained, an equivalent means is also contained in this invention and it deals in it. Therefore, the true scope of protection of this invention must be decided by a claim.

[0124]

[Effect of the Invention]

According to the manufacturing method of the deposition mask of this invention which has the

above composition, and the organic EL device using this, and the organic EL device manufactured by this, the following effects can be acquired.
[0125]
A user can raise [1st] the pattern accuracy over the effective deposition area which asks for vacuum evaporation.
[0126]
When vapor-depositing various elements simultaneously by a single process, the accuracy of a total pitch is raised and a defective fraction can be fallen [2nd].
[0127]
Alignment of a deposition mask and a substrate can be performed [3rd] correctly.
[0128]
Highly minute-ization of the effective luminous region which emits light by forming the dummy pattern field which is an invalid luminous region which does not emit [4th] light to an organic EL device can be attained.
[0129]
When tensile force is applied to a mask by a mask frame and it supports [5th], the pattern accuracy can be prevented from falling.
[Brief Description of the Drawings]
[Drawing 1]It is an exploded perspective view showing the conventional deposition mask.
[Drawing 2]It is a fragmentary sectional view of the deposition mask by drawing 1.
[Drawing 3]It is a top view of the deposition mask by drawing 1.
[Drawing 4]It is a perspective view of the deposition mask by one desirable embodiment of this invention.
[Drawing 5]It is a fragmentary perspective view showing the unit mask of the deposition mask by drawing 4.
[Drawing 6]It is an II-II line sectional view of drawing 5.
[Drawing 7]When tensile force is applied to a deposition mask, it is an II-II line sectional view of drawing 5.
[Drawing 8]It is a graph which shows the width deviation amount of the opening of the mask by this invention.
[Drawing 9]It is a top view of the deposition mask by drawing 4.
[Drawing 10 A] It is a schematic diagram showing the deviation and line deviation of a total pitch of a deposition mask by drawing 4.
[Drawing 10 B] It is a schematic diagram showing the deviation and line deviation of a total pitch of a deposition mask by drawing 4.
[Drawing 10 C] It is a schematic diagram showing the deviation and line deviation of a total pitch of a deposition mask by drawing 4.
[Drawing 11]It is a part plan showing some unit masks of the deposition mask by other one embodiments with desirable this invention.
[Drawing 12]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 13]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 14]It is a perspective view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 15]It is a top view of the deposition mask by drawing 14.
[Drawing 16]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 17]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.

[Drawing 18]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 19]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 20]It is a sectional view showing the state where the transparent conducting film and the metal conducting film were formed on the substrate.
[Drawing 21]It is a top view showing the case where form electrode external terminals and two or more organic EL devices are manufactured.
[Drawing 22 A] It is a top view of an organic EL device with drawing 21.
[Drawing 22 B] It is an III-III sectional view of an organic EL device with drawing 21.
[Drawing 23 A] It is a top view showing the state where the transparent conducting film was patterned.
[Drawing 23 B] It is an IV-IV sectional view of drawing 23 A showing the state where the transparent conducting film was patterned.
[Drawing 23 C] It is a V-V sectional view of drawing 23 A showing the state where the transparent conducting film was patterned.
[Drawing 24 A] It is a top view showing the state where the inner insulating film was formed.
[Drawing 24 B] It is a VI-VI sectional view of drawing 24 A showing the state where the inner insulating film was formed.
[Drawing 25]It is a figure showing the state where an organic layer or the 2nd electrode is vapor-deposited using an evaporation apparatus.
[Drawing 26 A] It is a top view showing the state where the organic luminous layer was vapor-deposited.
[Drawing 26 B] It is a VII-VII sectional view of drawing 26 A showing the state where the organic luminous layer was vapor-deposited.
[Drawing 26 C] It is an enlarged drawing of VIII of drawing 26 B showing the state where the organic luminous layer was vapor-deposited.
[Drawing 27]When the deposition mask of drawing 13 is used, it is a sectional view showing the state where the dummy hole transporting bed was provided.
[Drawing 28 A] It is a top view showing the state where the 2nd electrode was vapor-deposited.
[Drawing 28 B] It is an IX-IX sectional view of drawing 28 A showing the state where the 2nd electrode was vapor-deposited.
[Drawing 29]It is a top view of the organic EL device by one embodiment patterned using the deposition mask for the 2nd electrode formation.
[Drawing 30]It is a separation perspective view of the organic EL device by one desirable embodiment of this invention.
[Description of Notations]
20 Deposition mask
21 Unit mask
30 Mask frame
31 The welded place of a deposition mask

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is an exploded perspective view showing the conventional deposition mask.
[Drawing 2]It is a fragmentary sectional view of the deposition mask by drawing 1.
[Drawing 3]It is a top view of the deposition mask by drawing 1.
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[Drawing 5]It is a fragmentary perspective view showing the unit mask of the deposition mask by drawing 4.
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[Drawing 14]It is a perspective view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 15]It is a top view of the deposition mask by drawing 14.
[Drawing 16]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.
[Drawing 17]It is a top view of the deposition mask by other one embodiments in which this invention is desirable.
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[Drawing 25]It is a figure showing the state where an organic layer or the 2nd electrode is vapor-deposited using an evaporation apparatus.
[Drawing 26 A] It is a top view showing the state where the organic luminous layer was vapor-deposited.

[Drawing 26 B] It is a VII-VII sectional view of drawing 26 A showing the state where the organic luminous layer was vapor-deposited.
[Drawing 26 C] It is an enlarged drawing of VIII of drawing 26 B showing the state where the organic luminous layer was vapor-deposited.
[Drawing 27]When the deposition mask of drawing 13 is used, it is a sectional view showing the state where the dummy hole transporting bed was provided.
[Drawing 28 A] It is a top view showing the state where the 2nd electrode was vapor-deposited.
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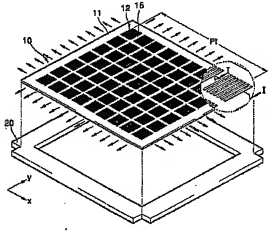
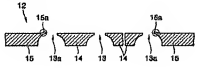
[Drawing 29]It is a top view of the organic EL device by one embodiment patterned using the deposition mask for the 2nd electrode formation.
[Drawing 30]It is a separation perspective view of the organic EL device by one desirable embodiment of this invention.
[Description of Notations]
20 Deposition mask
21 Unit mask
30 Mask frame
31 The welded place of a deposition mask

DRAWINGS

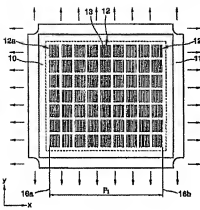
[Drawing 1]



[Drawing 2]



[Drawing 3]



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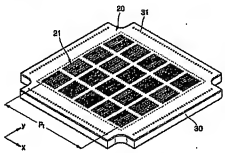
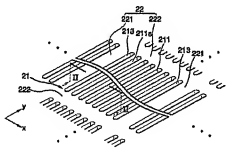


[Drawing 5]



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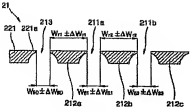
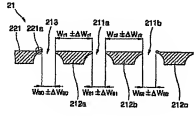
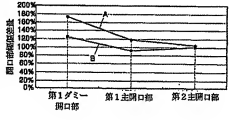


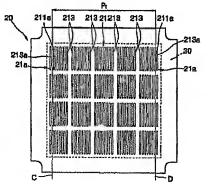
[Drawing 7]



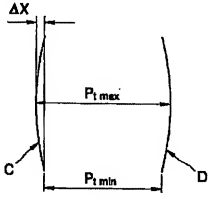
[Drawing 8]



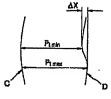
[Drawing 9]



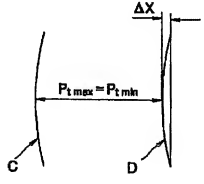
[Drawing 10 A]



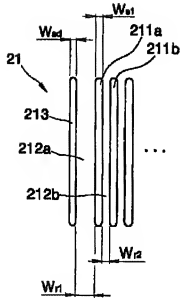
[Drawing 10 B]



[Drawing 10 C]



[Drawing 11]



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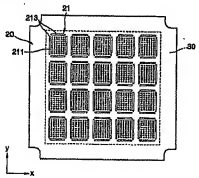
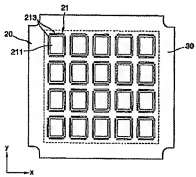
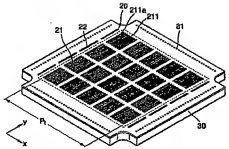


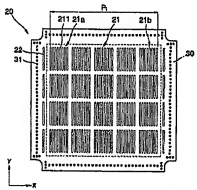
[Drawing 13]



[Drawing 14]



[Drawing 15]



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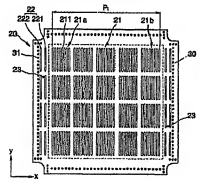
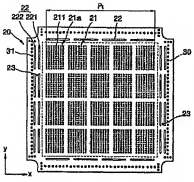
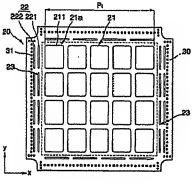


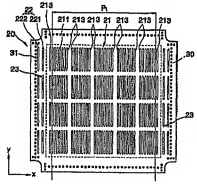
[Drawing 17]



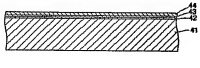
[Drawing 18]



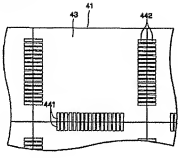
[Drawing 19]



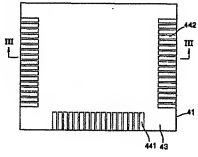
[Drawing 20]



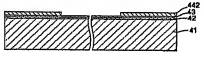
[Drawing 21]



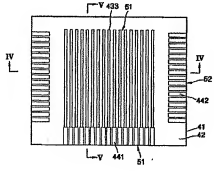
[Drawing 22 A]



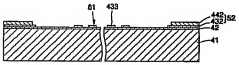
[Drawing 22 B]



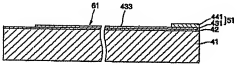
[Drawing 23 A]



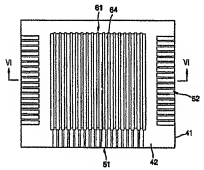
[Drawing 23 B]



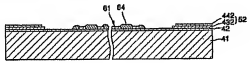
[Drawing 23 C]



[Drawing 24 A]



[Drawing 24 B]



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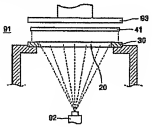
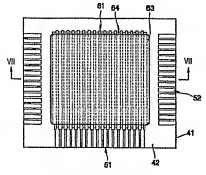
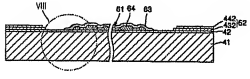


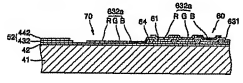
[Drawing 26 A]



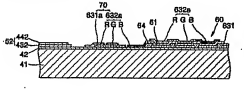
[Drawing 26 B]



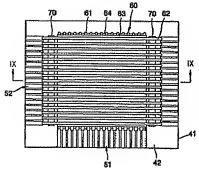
[Drawing 26 C]



[Drawing 27]



[Drawing 28 A]



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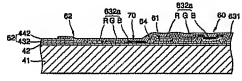

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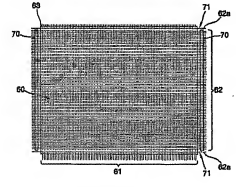
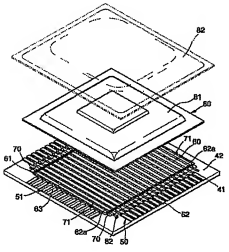


[Drawing 30]


82
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62a
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